THE COCA LEAF AND COCAINE PAPERS

EDITED BY
GEORGE ANDREWS
& DAVID SOLOMON

$15.95

THE COCA LEAF AND COCAINE PAPERS

EDITED BY
GEORGE ANDREWS
& DAVID SOLOMON

Millions of people are now aware that the popular, albeit illicit use of cocaine burns the nose and empties the pockets. But what only a relatively few number of experts know is that the coca leaf, from which the powerful concentrate cocaine is extracted, has been herbally employed for millennia to treat depression, fatigue, and stomach-ache, and to promote general well-being. The ancient Incas revered the plant. Sigmund Freud sang its praises, and millions of mountain people in South America still consume the coca leaf daily as an energizing tonic, with no apparent ill effects.

This anthology contains, in addition to the classic, historical papers on the subjects of coca and cocaine, the latest and the most accurate information available on how coca is grown and cured, comparing the chemistry and effects of both the leaf and its isolated alkaloids.

Editors David Solomon and George Andrews survey the modern myth of cocaine and scrutinize the top-secret recipe for Coca-Cola (comparing it unfavorably with some nineteenth-century

(Continued on back flap)

Digitized by the Internet Archive
in 2022 with funding from
Kahle/Austin Foundation

https://archive.org/details/cocaleafcocainep0000unse

THE COCA LEAF AND COCAINE PAPERS

The Coca Leaf and Cocaine Papers

Edited by George Andrews and David Solomon

NEW YORK AND LONDON
HARCOURT BRACE JOVANOVICH

Copyright © 1975 by David Solomon and George Andrews

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopy, recording, or any information storage and retrieval system, without permission in writing from the publisher.

Printed in the United States of America

Quotations from *The Big Drink: The Story of Coca-Cola,* by E. J. Kahn, Jr., copyright 1950, © 1959, 1960 by E. J. Kahn, Jr., are reprinted by permission of Random House, Inc., and The Bodley Head Ltd. "Cocaine Consciousness: The Gourmet Trip," copyright © 1975 by Jerry Hopkins, is reprinted by permission of the author. "Dealer: Portrait of a Cocaine Merchant," from *Dealer: Portrait of a Cocaine Merchant* by Richard Woodley, copyright © 1971 by Richard Woodley, is reprinted by permission of Holt, Rinehart and Winston, Inc. "The Consumers Union Report on Coca Leaf and Cocaine," from *Licit and Illicit Drugs: The Consumers Union Report on Narcotics, Stimulants, Depressants, Inhalants, Hallucinogens, and Marijuana—Including Caffeine, Nicotine, and Alcohol* by Edward M. Brecher and the Editors of *Consumer Reports,* copyright © 1972 by Consumers Union of United States, Inc., is reprinted by permission of Little, Brown and Co.

Library of Congress Cataloging in Publication Data

Main entry under title:
The Coca leaf and cocaine papers.
Includes bibliographical references and index.
CONTENTS: Andrews, G. and Solomon, D. Coca and cocaine: use and abuses.—Martin, R. T. The role of coca in the history, religion, and medicine of South American Indians.—Mantegazza, P. Coca experiences. [etc.]
1. Cocaine habit—Addresses, essays, lectures.
2. Coca—Addresses, essays, lectures. 3. Cocaine—Addresses, essays, lectures. I. Andrews, George.
II. Solomon, David, 1925-
RC568.C6C6 615'.782 75-12988
ISBN 0-15-118237-X

First edition

B C D E

CONTENTS

Coca and Cocaine: Uses and Abuses
George Andrews and David Solomon
3

The Role of Coca in the History, Religion, and Medicine of South American Indians
Richard T. Martin
20

Coca Experiences
Paola Mantegazza
38

Coca, Cocaine and Its Salts
William Martindale
43

The Divine Plant of the Incas
William Golden Mortimer
50

The Mariani Album: 1884–1913
243

Cocaine and the So-called Cocaine Habit
W. A. Hammond
247

Cocaine and Its Fascinations, from a Personal Experience
Frank W. Ring
253

Concerning Nasal Lesions Among Cocaine Sniffers
Leon Natanson
259

Mental Alterations Produced by Coca
Carlos Gutiérrez-Noriega
262

The Anti-fatigue Action of Cocaine and Habituation to Coca in Peru
Fernando Cabieses Molina
264

Cocaism and Cocainism
Otto Nieschulz
269

Cocaine Consciousness: The Gourmet Trip
Jerry Hopkins
277

Dealer: Portrait of a Cocaine Merchant
Richard Woodley
289

The Green and the White
Andrew Weil
318

The Gourmet Coke Book
Anonymous
337

The Consumers Union Report on Coca Leaf and Cocaine
Edward M. Brecher and the Editors of Consumer Reports
344

Index
363

The editors wish to acknowledge that this manuscript would never have emerged in its present form without the keen editorial judgment and persistent research efforts of Ms. Lin Claire Solomon.

GEORGE ANDREWS and DAVID SOLOMON

Coca and Cocaine: Uses and Abuses

AN EARLY WITNESS to the sudden increase during the seventies in the popular use of cocaine was journalist Jerry Hopkins, who observed, in *Rolling Stone:*

"In the pre-rock-and-roll fifties, 'Coke Time' was what Eddie Fisher called his NBC television show. Today it is a reference not to a soft drink, but a hard drug: cocaine, ordinarily known as a rich man's high, but fast becoming the 'in' drug."

Cocaine's rapidly spreading popularity is partially due to ex-President Nixon's temporarily effective operation of choking off supplies of Mexican marijuana by tightening customs surveillance at the border. Shipments of contraband marijuana, bulky and difficult to hide, became riskier and less lucrative for professional smugglers than compact consignments of cocaine, a far more profitable product. Thus a cocaine backlash was precipitated by a costly police and prohibitionist campaign against marijuana that was impossible to maintain for practical considerations—such as mile-long auto queues with impatient, irate middle-class tourists waiting hours on end to cross the U.S.-Mexican border.

However, the current craze for cocaine has far deeper intrinsic and historical roots. In the 116 years since the discovery of this crystalline substance (only one of the fourteen alkaloids that have been isolated from the leaves of *Erythroxylon coca,* a South American shrub), its reputation as an extraordinarily effective physical and mental stimulant—with those attendant euphoric virtues generally associated with powerful energizers—has been recognized throughout the world. Whatever its cost, whatever the social milieu of its use has been, cocaine has always been both used and abused because it temporarily makes the user feel stronger and happier.

One such user, reporting to us anonymously, stated: "When the mind is transported by cocaine, hung-up, difficult-to-face psychic areas

—not usually open to conscious thought—can be penetrated. Sometimes the tangle can even be resolved. The experience might be compared to stepping into an express elevator on the ground floor of the Empire State Building. Within seconds I'm on the roof of the world, staring down at the swarms of human ants beneath my feet, suspended between heaven and earth. I look down upon my 'normal' fragmented condition with compassion, amusement, or whatever emotion seems most appropriate."

But our informant also told us: "An air of energetic confidence and peak moments of great mental clarity soon give way to the return trip back to the ground floor as the effects wear off. . . . I plunge from the heights of heaven to the depths of the abyss. Deep depression, mental bitterness, and physical discomfort accompany this phase of the experience. . . . The urge to return to that enlightened realm of the summits, to know again that almost magical intensity of mental functioning, is very difficult to ignore. Every cocaine user I have ever met experienced to some degree expanded mental powers and increased physical energy. This combination of effects renders the drug desirable to many people who have creative abilities."

Today, upper-middle-class trend setters are eagerly using their affluence—black-market cocaine can be outrageously pricey—to combat their boredom: cocaine is a mighty stimulant. To less economically favored pleasure punters, the cost of cocaine might seem higher than the stimulation it provides, but not to considerable and growing ranks of well-heeled hedonists with more than enough money to burn holes in their noses.

Cocaine is a powerful concentrate, and certainly can be dangerously poisonous when immoderately used. Nevertheless, it is not *physically* addicting, as are opiates and barbituates. Moreover, its almost magical energizing qualities are well founded.

One of the first great scientists to recognize cocaine's virtues, not only as an anesthetic but as a stimulating euphoriant, was Sigmund Freud. By 1884 Freud was both personally using and championing the use of cocaine. Then a brilliant, but not yet controversial, young neurologist, Freud discovered that by swallowing small quantities of this wondrous new alkaloid, things went far better with his nervous stomach, which it calmed, and his raging libido, which it fanned. He wrote to his fiancée that same year, warning her exuberantly: "Woe to you, my Princess, when I come. I will kiss you quite red and feed you until you are plump. And if you willfully resist, you shall see who is the stronger, a gentle little girl who doesn't eat enough or a big wild man with cocaine in his body."

Two years later, the pause that refreshed our great-grandparents

above all others, Coca-Cola, which then contained cocaine, sparkled its way to the top of the pops. During the Gay Nineties anybody could saunter into a drugstore and buy cocaine in a variety of forms. Indeed, it appeared in so many guises that the druggist might well have asked the customer whether it was wanted to be sniffed as a powder, nibbled as a bonbon, sucked as a lozenge, smoked as a coca-leaf cigarette, rubbed on the skin as an ointment, used as a painkilling gargle, inserted into bodily cavities as a suppository, or drunk as a thirst-quenching beverage, such as Coca-Cola.

The Gourmet Coke Book, a well-researched anonymously authored work, picks up the story: "Cocaine was legally accessible to everyone. Advertising in the United States declared open season on it and a fad for cocaine raced through the country. Coca cigarettes and coca beverages and cordials were advertised on billboards. A famous medical firm of the time claimed cocaine not only cured alcoholism, but also made the user courageous and intelligent." Even the celebrated fictional character Sherlock Holmes considered it fashionable to "shoot" cocaine, declaring it aided his powers of deductive reasoning.

As the use of cocaine became more widespread, the abuse of the drug also increased. Chronic abuse resulted in nasal septum ulcerations, paranoid delusions, insomnia, and malnutrition.

In 1906 the Pure Food and Drug Act ended the history of legal cocaine in the United States. At this point, cocaine began to receive negative press, and some of the most serious criminal and immoral behavior was directly attributed to cocainism. A noted medical journal even ascribed an entire crime wave to the cocaine habit.

"Authorities" stated that the crime wave that swept over the black population of the southern United States during the turn of the century directly followed the prevalence of the cocaine habit in that area. They seemed to feel that there appeared to be little doubt the drug was an important contributing factor to that crime wave. In another instance, the same journal went so far as to say that the general effects of cocaine upon the intellect tended toward true insanity. Nevertheless, cocaine consumption continued to grow, with illicit smuggling operations supplying the drug to its users.

It was also surmised that cocaine use reached new statistical highs during Prohibition.

At the 1925 International Opium Conference in Geneva, the United States unsuccessfully attempted to legally limit the production of coca leaves to amounts required for scientific and medical purposes. At that time, it was estimated that the world's total annual need for coca leaf for medical purposes was anywhere between 200 and 500 tons; yet Bolivia and Peru indicated that each year an estimated 15,000 tons

was produced. Much of that was chewed by the natives of those two countries, but a good deal of it was processed into cocaine and illegally exported to Europe and the United States.

During the twenties and thirties, the rise in promiscuity led to the return of cocaine use in the United States and Europe.

Cocaine has been described as a sexual stimulant. It has historically been used as a climax inhibitor for both males and females as well as a sensory stimulant. This seemingly contradictory statement can be explained by the threshold theory of cocaine. If the drug is abused or overused during a specific period of time, the strong, sexually stimulative nature of the drug changes to one of sexual frustration, where erections and orgasms become almost impossible. Each individual's tolerance must be self-determined in order to prevent the unpleasant experience of sexual impotence or frigidity.

The 1930's was the first time that a European country ranked first in cocaine use. According to the United States Narcotics Commission, Germany surpassed Peru as the leading user of cocaine. It is believed that many of the Nazi regime's high command were morphine and cocaine users. The most prominent of these was Hermann Goering, head of the Nazi *Luftwaffe* and a known morphine addict and cocaine user. Between 1934 and 1945 Goering lost eighty-five pounds by "dieting" with cocaine. Some people close to the Nazi power hierarchy went so far as to claim that the excessive abuse of cocaine was one of the major factors contributing to the delusions of strength and paranoia rampant among Nazi leaders. Hitler may have been using cocaine when he said, "Russia? Why not?"

People in the United States also indulged in cocaine use, especially in so-called high society. Cole Porter's "I Get a Kick Out of You," from the Broadway show *Anything Goes,* originally contained the line "I get no kick from cocaine." This was later discreetly changed to "Some like their perfume from Spain." In one of his best-known films, *Modern Times,* Charlie Chaplin snorts a white powder, referred to as nose powder, while in jail, which could well be interpreted as cocaine. He then proceeds to powerfully overwhelm all obstacles in his path under this forceful influence.

The rise of cocaine use in the United States ended abruptly as World War II began. As more severe penalties and harsher drug legislation for smuggling and selling cocaine went into effect, the drug became a premium item for the user and its price increased exorbitantly, so that it was and still remains the "rich man's drug."

As opposed to the poverty of the Andean Indians, the affluence of the cocaine culture in western civilization is readily visible. Musicians, the wealthy jet set, advertising executives, personalities of radio, tele-

vision, and film, artists, photographers, models, call girls, pimps, and salesmen have been linked with cocaine for some time. Although the cocaine subculture is growing, as evidenced by expanded coverage in magazines, journals, and mass media, its high price has kept the drug within the group of people whose means are accessible to its exorbitant cost. However, few hedonists who search for the ultimate pleasure trips leave cocaine off their list of desired commodities. Much of the reason for this could be the strong sexual implications of the drug. Its popularity increases as the desire to strive toward the hedonistic life style increases.

It would be inaccurate and misleading to confuse the effects of such a concentrated "rich man's drug" with the far milder physical and mental stimulation enjoyed by certain tribes of South American Indians, who chew (as their ancestors did for millennia) carefully cured, fresh-gathered coca leaves, which contain only a small percentage of pure cocaine.

However prehistoric the use of coca may have been, the known chain of events must begin with the Incas of Peru. The coca shrub exerted a powerful influence upon the political, religious, and social structure of their colossal empire. The Inca aristocracy restricted the use of coca to members of its hierarchy. The insignia of royalty was the *chuspa,* or coca pouch, from which leaves were distributed to favorites. Young men who survived difficult and dangerous ordeals that initiated them into knighthood were not dubbed with a sword, but were presented with coca pouches filled with leaves as a symbol of their rank.

The privilege of chewing coca was extended to royal couriers. These indomitable messengers jogged like a human pony express up and across the Andes, the world's second highest and perhaps most forbidding mountain range. Their masters well understood that without coca leaf such incredible feats of physical stamina would not have been possible.

Prayers were not considered valid unless said with coca leaf in one's mouth. If coca was the last thing the dying tasted, they were sure to go to Paradise. The leaf was also buried with the dead to sustain them on their long journey through the hereafter.

When the Spaniards arrived, they found solid-gold replicas of coca plants in the Inca temples. They promptly melted these and other marvels of exquisite workmanship into ingots for easier transport back to Spain. Within the next few centuries, they also wiped out over three-quarters of the original inhabitants, including the entire aristocracy.

At first the Roman Catholic Church tried to stamp out coca use,

denouncing it as demonic. However, mine and plantation owners found that they could get more work out of the Indians with less food if they gave them coca leaf. In the mines expendable Indian slave laborers were forced to work around the clock for days on end until they dropped. This continuous hard labor was interrupted only by a ten-minute rest period every four hours—to chew more coca. In spite of having denounced coca as demonic, economic considerations overrode spiritual reservations: bishops and other church officials covered their bets, dealing in the leaves on a vast scale and making enormous profits.

The Coca-Cola Corporation, rather than the Catholic Church, is now raking in those enormous profits. In an elegant exposé of Coca-Cola, *The Big Drink,* E. J. Kahn, Jr., writes: "The [Coca-Cola] export men are fond of pointing out that only a small fraction of one percent of the contents of a foreign-brewed bottle of Coke—a secret ingredient—emanates from the United States, and that overseas bottlers . . . purchase the rest of the ingredients . . . from indigenous sources."

This mysterious fraction of one per cent is exported by the Coca-Cola Corporation from the United States to its foreign subsidiaries, passing through customs all over the world as "Coca-Cola powder." If a customs analysis of it has ever been made, the findings have never been revealed.

The Coca-Cola Corporation reluctantly admits that its product still contains a flavoring agent derived from decocainized coca leaf. On the other hand, it has never disclosed, among other mysteries, the process by which coca leaves are decocainized before being used in Coke. Nor has the corporation ever indicated where or under whose supervision this processing occurs. No chemical analysis of the essence thus obtained has ever been publicly divulged. The Coca-Cola folks claim that it is purely for flavoring purposes.

The precise nature of Coca-Cola's secret ingredients has been a subject of considerable speculation for many years.

The two most important alkaloids in coca leaf besides cocaine are ecgonine and a pungent, volatile aromatic called cuskohygrine. About the latter, little is known but much is suspected. Germany's Professor Otto Nieschulz, writing as late as 1969, stated that cuskohygrine's pharmacological properties have never been investigated, and are completely unknown.

Modern pharmaceutical processing involves the extraction of cocaine from coca leaf by such chemical techniques as leaching in strong alkali. This process removes the ecgonine as well, but Dr. Nieschulz observes: "In the leaves of Peruvian origin examined by us, cuskohygrine was

present as the second main alkaloid, next to cocaine. . . . *It is not one of the ester-alkaloids separable by alkali*" (italics added).

Thus the processed decocainized leaves—precisely those leaves that the Coca-Cola Corporation admits using as a flavoring agent—must still retain some cuskohygrine.

The possible presence of cuskohygrine in Coca-Cola becomes a matter of enormous relevance in the light of Dr. Nieschulz's statement: "According to these findings, cocaine, ecgonine, or cuskohygrine, alone or together, could cause the psychic effects of coca use, its influence on physical performance, and its antidepressive effects."

Since it now seems likely that things might not go so much better with Coca-Cola if it did not contain cuskohygrine, it bears re-emphasizing that the aromatic's active pharmacological properties have never been looked into fully and remain to this day virtually unknown . . . except perhaps to the heads of the corporation that has concealed its secret ingredients from outsiders—like the rest of the human race—for almost ninety years.

The renowned anthropologist Julian H. Steward, author of *The Handbook of South American Indians* (published by the Smithsonian Institution in 1946), also expresses doubt that cocaine is the *only* or even the *main* factor in the energizing principle found in coca leaf. He wrote: "Whether the fatigue-dispelling effects of coca as used by the South American Indians are due to liberation of the cocaine content or of other substances is not certain, according to S. F. Blake in *Agriculture in the Americas* (vol. 3, 1943). In any case, coca chewing should not be confused with cocaine addiction. The chief physiological effects of coca chewing are the allaying of thirst and hunger and the freeing of bodily energy for prolonged physical exertion, 'presumably by making foods already stored in the body available for conversion into man-pounds.' "

There are several reasons why so curious a substance as cuskohygrine —which, as we shall soon learn in greater detail, had also been described as active by two noteworthy nineteenth-century coca watchers—escaped the commercial attention of the various pharmaceutical companies for over a century. Readily accessible and reasonably stable, cocaine was then medicine's new wonder drug. The market for it was profitable and expanding rapidly. It had revolutionized modern ophthalmic surgery, and was used for a multitude of other therapeutic applications as well. Pharmaceutical giants like Merck and Parke-Davis competed to produce the best quality at the most economical price for a discriminating market. The target was cocaine, not some will-o'-the-wisp volatile aromatic which their processing chemists found only in trace

amounts in the dried leaves made available to them. (When volatile aromatic substances evaporate, their active principles escape during the drying process and thereafter.) The Andes Indians have no way to preserve such a volatile substance except by carefully curing the fresh leaves, which they cultivate to ensure an ever-present supply.

William Golden Mortimer, an eminent turn-of-the-century New York physician, was, as Sigmund Freud, an early coca champion. Dr. Mortimer was also firmly convinced that the aromatic cuskohygrine was potent. In his massively detailed comprehensive classic *Peru: History of Coca,* published in 1901, he reported: "Since 1885, most of the writings and experiments of physiologists upon coca seem to have been based upon the idea that a single active principle should represent the potency of the leaf. . . . This is a false supposition. The qualities of Coca are not fully represented by any one of its alkaloids thus far isolated. . . . Many experimenters have contented themselves with enumerating the physiological effects of cocaine rather than that of Coca . . . thus . . . the Coca leaf as used among the Indians of Peru is one thing, and the variety exported because of its large alkaloidal content is wholly another matter. This is a distinction which any lover of tobacco will readily appreciate, for surely a fine cigar is never estimated by the amount of nicotine which it contains, nor is the flavor or quality of a delicate tea measured by its percentage of theine."

To trace the history of both the coca leaf's various active ingredients and those present in Coca-Cola, we must go back to 1885, when John Pemberton, a small but ambitious patent-medicine manufacturer in Atlanta, Georgia, launched a beverage containing coca leaf, which he named French Wine Coca. This was an obvious imitation of Angelo Mariani's famous Coca Wine, a French tonic then enjoying extraordinary popularity in Europe.

In 1886 Pemberton removed the wine from his formula and introduced extract of kola nut, which is rich in caffeine. Adding other new ingredients, which remain unspecified to date, he then renamed his beverage Coca-Cola.

Thus Pemberton's new drink was laced with *at least* two of the most effective stimulants then known to science: cocaine and caffeine. Distillates of the leaves of the coca shrub, combined with extract of kola nut, imparted a very special zip and flavor to the syrup base. Moreover, Pemberton's patented trademark, Coca-Cola, fell trippingly from the tongue as readily as his bouncy beverage flowed down the throat. Obviously unaware of the incredible commercial potential of his brew, Pemberton soon sold his trademark and formula to what is now the Coca-Cola Corporation.

The Coca-Cola Corporation does not, of course, grant access to the

minutes of its board meetings, but one may imagine what might have gone down at the first session after Pemberton had been bought out:

THE SECRETARY: That kola nut's dandy, but things go better with coca.

THE CHAIRMAN: Capital, gentlemen! Now, what else can we spark it with?

THE TREASURER: Let's spark it with carbon dioxide gas!

And so, with CO_2, it came to pass: sparkling and effervescent, Coke became a gas. Concocted with carbonated water and refrigerated, it fizzed its way all over the world. The first and most successful of the *soft* soda pops was *hard.*

From the start the Coca-Cola Corporation faced a small army of competitors who were busy flogging their own patented cocaine concoctions. Coca-Cola's name itself at least made it reasonably clear that it was made with coca. But far too many patent-medicine labels and high-pressure advertisements flamboyantly proclaimed miraculous cures for their avowedly wholesome and harmless tonics, elixirs, soothing syrups, and nerve medicines, without mentioning that they were frequently spiked not only with cocaine, but also with potentially dangerous and addicting drugs, such as heroin, morphine, and opium. Nearly all contained as a base a sizable jolt of that ancient anodyne, ethyl alcohol, which was frequently coupled with other toxic agents such as chloroform, bromides, and arsenic.

In a period when only a small segment of the population could afford the services of trained physicians, patent-medicine hucksters, unhampered, preyed upon the millions of ignorant sufferers who sought relief in over-the-counter fixes. In those days the combination of unrestricted commercial greed, on the one hand, and an uninformed public with real needs, on the other, resulted in the addiction of victims of all ages. Nevertheless, it took many years before public alarm, triggered by sensational press coverage, pressured Congress into passing the Pure Food and Drug Act. This law strove to prohibit food and drug manufacturers from using dangerous, undisclosed ingredients.

This was followed, shortly before World War I, by the Harrison Act, the granddaddy of all subsequent prohibitionist drug legislation. The Harrison Act unsuccessfully attempted to deal with the problem of drug abuse by making the nonmedical use of all psycho-active drugs except alcohol and tobacco punishable by law. Critics have often pointed out that such total prohibition, aside from being unworkable and criminalizing, is an infringement upon civil liberties, since it represents a breach of constitutionally guaranteed freedom of conscience.

Under pressure from the federal government, the Coca-Cola Cor-

poration switched from ordinary coca leaves to decocainized coca leaves in 1906. However, they continued and still continue to use thousands of tons of decocainized coca leaves annually.

It appears most fortunate, for the Coca-Cola Corporation, that it has never faced the sort of competition that a certain South American beverage might have provided. In 1913 Colonel P. H. Fawcett, the explorer, led an expedition into the remote coca-chewing areas of Bolivia. There he discovered that things went better with "a very tasty drink I have never found elsewhere. . . . Known as 'coca,' it is made from a distillation of specially selected coca leaves in alcohol, with other ingredients added, and I don't recollect ever tasting anything quite so good. In color and consistency it is like green Chartreuse, but its flavor is entirely its own. A wineglassful allays the pangs of hunger and adds to endurance, besides being an excellent stomachic. Anyone lucky enough to obtain the recipe and produce it in Europe or the United States would, without doubt, make a fortune. I took a dozen bottles home with me, but, alas, they did not last very long!"

E. J. Kahn, Jr., further states, in *The Big Drink:* "The Coca-Cola people have made that fortune, from sales of billions of dozens of bottles. But in a drink of Coca-Cola there is so little even of what the company calls a 'non-narcotic extract from decocainized coca leaves' that if a man who has polished off a Coke or two feels less hungry than he did before, it is for the simple reason that a stew of water and sugar is awash in his stomach. . . . The company . . . has since described the formula as 'a magic secret, a treasure to be vigilantly guarded.' On its 1958 balance sheet, the company listed 'Formulae, trademark, and goodwill—at cost: $40,130,632.' In Coca-Cola circles, the ingredients that go into Coke syrup are known, arcanely, as 'merchandises.' There are at least fourteen of these. Merchandise No. 1 is sugar, No. 2 is caramel, No. 3 is caffeine, No. 4 is phosphoric acid, and No. 5 is a blend of three parts coca and one part kola. Beyond that, all is hazy."

Coca-Cola's forebear, Mariani's Coca Wine, was no stew of water and sugar awash in the stomach. By all accounts it was so potent, fully flavored, and aromatic that it found favor internationally, leaving in its wake a host of imitations. Many of the greatest creative geniuses of the late Victorian era, as well as leaders in the highest positions of power—kings, emperors, popes, cardinals, prime ministers, and presidents—sang its praises. Enthusiastic testimonials were showered on Mariani by Thomas Edison, H. G. Wells, Henrik Ibsen, General Lyautey (conqueror of Morocco), President McKinley, mathematician Henri Poincaré, astronomer Flammarion, playwright Edmond Rostand, sculptor Auguste Rodin, composers Gounod and Massenet, leg-

endary actress Eleonora Duse, Louis Blériot (who sipped Mariani's wine as he flew the Channel for the first time in 1909), Jules Verne, and Émile Zola. In the British Museum there is a set of thirteen thick de luxe volumes entirely devoted to testimonials made by users of Angelo Mariani's unique Coca Wine.

William Golden Mortimer reveals what made so many sensitive connoisseurs value Mariani's Coca Wine more than any of its many imitators: Mariani's experimentation "led to combining several varieties of leaf, setting aside those which contained chiefly the bitter principle—since known to be cocaine—and selecting those that contained the aromatic alkaloids. An extract of these blended leaves embodied in a wholesome wine was found to represent the peculiar virtue of Coca as so much prized by the native users. . . . It is certain that the preparations of Coca manufactured by Mariani are entirely different in aroma and action from other Coca preparations which I have examined. . . . Many details essential in the cultivation of tea and coffee . . . suggest similar necessities in the cultivation of Coca. In Ceylon the best coffee is grown from 3,000 to 4,500 feet above the sea, where rain is frequent and the temperature moderate, and, like Coca, *the higher the altitude in which the shrub can be cultivated without frost, the better is the quality of the product. Although the yield may be less, the aromatic principles are more abundant and finer than that produced in the lowlands*" (italics added).

Parenthetically, we might add that this is also true of another highly valued and deeply enjoyed aromatic herb, cannabis.

"There are two varieties of leaf coming to the North American market," Mortimer goes on, "the Huanuco—or large leaf, sometimes referred to as the Bolivian Coca, and the Truxillo—or narrow leaf, known as Peruvian Coca. In selecting a leaf the several manufacturers with whom I have corresponded have assured me that they base their choice upon the assay and yield of cocaine. For this reason the Huanuco leaf is the variety commonly found in the market, as it contains a larger amount of cocaine than the Truxillo leaf, which is considered less profitable because of its lower yield of this alkaloid. The native user, however, does not select the *hatun-yunca*—or large leaf Coca, his choice never being influenced by the amount of cocaine presumably present in the leaf chosen. . . . A combination of aromatic principles renders the leaf of more desirable flavor. These principles, though commonly asserted to be exceedingly volatile, are still found in well-preserved exported leaves."

Mortimer continues: "The characteristic aroma of the leaf is lost when it is improperly kept. . . . A freshly opened bale of properly dried and well preserved Coca has a peculiar aromatic odor, faintly

like vanilla or perhaps suggestive of a finely blended China tea, though more delicate . . . which once learned can always be readily detected and must afford a means for immediate recognition of the true Coca preparations as distinguished from spurious combinations made with cocaine or from poor leaves. *The Indians select the leaf from its characteristic odor alone, without necessitating even a tasting. This delicacy is only to be preserved by a proper drying and curing*" (italics added).

In 1885 Dr. Henry H. Rusby, a botanical and pharmaceutical expert, was sent by Parke-Davis Laboratories to South America to experiment with and learn all he could about coca use and processing. He was the first of a series of scientific investigators to reveal that coca's energizing effects were not solely due to its cocaine content. Rusby wrote: "Nor is it proper to proceed concerning Coca-culture without a few words concerning what is meant by the 'best quality' of coca leaves. The best quality of Coca leaves, to a manufacturing chemist, means those which will yield the largest percentage of crystallizable cocaine, while the same leaf might be considered for domestic consumption as representing one of the lower grades. It is highly probable that the amount of cocaine forms no element in the Indian's estimate of the quality of Coca. . . . Coca leaves are classed in general as *hojas dulces* (sweet leaves) or *hojas amargas* (bitter leaves). The former are made sweet by the abundance of alkaloids other than cocaine. While it is true that a greater percentage of these alkaloids is usually accompanied by a larger percentage of cocaine also, yet the variation in the amount of the latter is not so great as in the former; so that while in the sweet leaves the bitter taste of the alkaloid is masked by the presence of other alkaloids, in the bitter leaves its flavor is the predominant one. The presence, then, of these *sweet alkaloids,* as we may call them, translating the simple and expressive term of the Indians, determines the domestic value of Coca. . . . Cultivation is based on the production of the highest percentage of these alkaloids."

Dr. Rusby distributed coca leaves from which the cocaine had been extracted to a group of mountain-dwelling Indians, all confirmed coca chewers. They reported to him that the processed leaves were still potent.

Dr. Rusby also correctly noted that the chemical constituents of the plant begin to change as soon as it is picked. This observation was in agreement with the findings of the Swiss naturalist Von Tschudi, whose extensive travels through South America in 1837 led him to conclude that the "smell of the fresh dried leaves in a mass is almost overpowering; but this smell entirely goes when they are packed in the sacks." Moreover, Dr. Rusby's classmate and lifelong colleague, William

Golden Mortimer, wrote that inexperienced travelers were warned not to sleep near piles of drying coca leaves. Certainly no weary Inca courier would ever have tried to rest near such piles, knowing that the stimulating nature of the pervasive fresh aroma would disturb his much-needed slumber.

Dr. Mortimer further elaborates Dr. Rusby's discoveries concerning cuskohygrine: "There has been much discussion and uncertainty upon the Coca products, particularly so as to those of an oily nature, originally designated as hygrine. . . . The assertion that hygrine is never present in Coca leaves, but is merely a decomposition product of cocaine, lends an added interest to the research of Dr. Rusby. . . . From repeated examinations he found a certain yield of alkaloids, while specimens of the same leaves sent to the United States yielded from treatment by the same process less than half the percentage of alkaloid that he had obtained. This prompted him to search for the possible source of error, and *it was found that after all the cocaine was eliminated there was still a decided alkaloidal precipitate* [italics added]. From this it was concluded that: 'native Coca leaves contain a body intimately associated with the cocaine and reacting to the same test, which almost wholly disappears from them in transit.' "

The brilliance of Rusby and Mortimer may be appreciated in the following quotation when it is realized that their conclusions anticipated by sixty-five years the findings of Dr. Nieschulz. Mortimer continues: "This result indicates the presence in Coca leaves of some extremely volatile principle to which decided physiological properties are attached, which may also be obtained from suitably preserved leaves. . . . The action of Coca and cocaine, while similar, is different. *Each gives a peculiar sense of well being, but cocaine affects the central nervous system more pronouncedly than does Coca, not—as commonly presumed—because it is Coca in a more concentrated form, but because the associate substances present in Coca, which are important in modifying its action, are not present in cocaine* (italics added). The sustaining influence of Coca has been asserted to be due to its anaesthetic action on the stomach, and to its stimulating effect on brain and nervous system. But the strength-giving properties of Coca, aside from mild stimulation to the central nervous system, are embodied in its associate alkaloids, which directly bear upon the muscular system."

As with marijuana and grape vines, there are many different types of coca shrub. Each may contain varying amounts of several potent alkaloids, which in turn may account for a broad spectrum of physical and psychological effects. We are not the first to suggest that coca leaves be classified with loving care, as fine wines and exquisite teas

are, according to their place of origin and date of harvest, with the proportions of their alkaloidal contents scrupulously analyzed and identified.

William Martindale was the founding author of *The Extra Pharmacopoeia,* the officially recognized pharmaceutical handbook found in drugstores throughout the United Kingdom. In 1886 he wrote a small volume, *Coca, Cocaine and Its Salts,* which in ten years went into four editions. In this gem of coca scholarship, Dr. Martindale had the temerity—we may safely surmise, based on his personal use—to suggest to his Victorian contemporaries (dedicated caffeine connoisseurs to a man) that they drink a coca beverage in place of tea or coffee. The life-and-blood image of an urbane Victorian scientist, pragmatically touting what he considered a harmless herbal substitute for his fellow Britishers' nearly sacred traditional stimulant, tea, might well be creatively edited into coca's mythic historical montage in a prose filmlet, something like this:

In the first tableau, scantily dressed, underfed, coca-chewing Peruvian Indians are seen struggling up and over frozen, sky-high, oxygen-thin mountain passes, carrying one hundred pounds on their backs from dawn to dusk.

Next scene: quick cut to fogbound lamplit London in the late 1880's. Basil Rathbone, playing Dr. William Martindale, is lecturing on the role of coca to a high-minded abstinence society. The camera captures him, then crosscuts to his prim audience as he delivers his *punch* line: "And lastly, I commend to you the use of coca as a beverage to substitute for tea or coffee!"

Finally, a slow dissolve to the *Image of the Depraved Cocaine Addict,* as scripted by an anonymous civil-service ghost for the *ancien* U.S. Bureau of Narcotics. Our addict, a prohibitionist scarecrow, is seen slumping in the shadows of a dark alley, an emaciated, nosebleeding, physical wreck, on the verge of mugging an innocent passer-by to pay for his next snort.

What makes the stereotype of the cocaine *abuser* (statistically slumping in the shadows as well, for very few of the multitudes of occasional cocaine users wind up so destroyed) at odds with the vision of coca use as projected by such coca savants as Martindale, Freud, Mortimer, Rusby, and Steward? All those wise gentlemen had learned from their masters, the Andes Indians, that the various alkaloids present in coca leaf—including cocaine—are both harmless and life enhancing if taken orally and in moderation. For twenty or thirty minutes the Indian chews, or, more correctly, sucks, coca leaves containing only very small amounts of cocaine, perhaps only 1 per cent. Dr. Martindale and other

nineteenth-century proponents of coca sipped mild infusions that were slowly absorbed, causing no shock or damage to the nervous and digestive systems.

So benign and rational a use of coca is a far cry from today's vogue for slamming concentrated cocaine rapidly into the bloodstream by snorting it into the delicate mucous membranes lining the nasal passages. This rather crude assault produces an intense mental and physical rush, but overindulgence can be irritating, and, if prolonged, can burn a hole right through the nose. Compulsive cocaine snorters can expect serious erosions, nosebleeds, and even perforations of the septum dividing the nasal passages.

While dangers of cocaine abuse and maladministration are not to be glossed over, they tell only a fraction of the story. To better grasp the vast difference between an artificially concentrated drug with potentially lethal toxicity and its far milder form as a botanical preparation, we suggest an analogy with that popular *nondrug* drug, alcohol.

Although it has been socialized, ethyl alcohol, present in all fermented and distilled drinks, is a *hard* drug. The simple fermentation of sugars and starches in hops, malt, and barley produces the mildly alcoholic *soft* drug beer, which normally contains between 3 per cent and 6 per cent pure ethyl alcohol. However, if it is distilled it becomes absolute ethyl alcohol. Several ounces, taken within a short space of time, can cause such dire toxic reactions as loss of consciousness and vomiting, which can be a lethal combination. The person who knocks down one eight-ounce glass of pure ethyl alcohol (equivalent to sixteen ounces of 100-proof spirits) is well on the way to delirium tremens, coma, and death.

The analogy is sound: coca leaves, moderately consumed, are as harmless as beer drunk in moderation—and certainly more energizing. Pure cocaine, immoderately used, can be as poisonous as the immoderate consumption of the pure ethyl alcohol contained in distilled, bonded bourbon.

Enlightened social establishments may soon be sensible enough to restore coca to its rightful place in daily life. Practical applications might include collecting the aromatic principles of the leaf and dispensing them in both beverages and inhalers. Now that the cuskohygrine is out of the bag, other corporations and private individuals may assert their legal right to buy "decocainized" coca leaves just as the Coca-Cola Corporation does, thus breaking the virtual monopoly held on this key substance since World War I.

Not long ago a managing editor cautiously advised us that his company might be interested in publishing *The Coca Leaf and Cocaine*

Papers if we prefaced the collection with an editorial disclaimer. In it we were to assert that our book was not to be taken as a guide to the illegal use of these substances.

We have chosen not to issue such a disclaimer, since to do so would imply that the aim of our anthology, which is to provide the most accurate information available about coca leaf and cocaine, would lead to abuse and antisocial behavior. However, we are convinced that the present social context of official ignorance and ignorant self-abuse can only be affected positively by our efforts to present the truth about these substances.

The present drug laws of most nations place coca leaf in the same punitive category as cocaine and heroin. Yet anyone with a bottle of Coca-Cola in hand holds a dilute extract of coca leaf, which in all probability is mildly active despite being decocainized.

William Golden Mortimer made the succulent point that it is as ridiculous to illegalize coca leaf because it contains minute amounts of cocaine as it would be to condemn peaches because their pits contain minute amounts of lethally toxic prussic acid.

The world-renowned botanical authority, Dr. Richard Evans Schultes, the director of the Harvard Botanical Museum, has written: ". . . even at this late date, [coca] deserves further study from many points of view. . . . What is very commonly overlooked or even purposely ignored in many governmental and sociological circles is the fact that coca, as chewed by the native, is not of necessity physically, socially and morally dangerous enough to warrant prohibitive laws. . . . Coca-chewing apparently does not lead to addiction. Peruvian Indians conscripted for the army, where coca is forbidden, are not unduly bothered by the lack. . . . For the greater part of eight of my twelve years in exploration of the northwest Amazon, I used coca daily and found no desire for it when, back in the capital city, I had no supply. It is perhaps roughly comparable to the use of tobacco in our culture, and is certainly much less of a problem in the Andes than is alcohol in a mechanized society such as ours in the United States. Unwise legal prohibitions in certain Andean areas, aimed at extirpation of the coca-custom, have invariably driven the Indian—deprived in his inhospitable, cold altitudes of the euphoric coca—to the dangerously poisonous, locally distilled, alcoholic drinks, with an attendant rapid rise in crime of every description."

Dr. Norman Taylor, the former director of the Bronx Botanical Gardens, has stated that coca "was nurtured in the high purity of the Andes without a taint of depravity, and was, if not divine, so considered for countless centuries. Even today, it has the touch of the miraculous."

The legend from the land of its origin is that at the dawn of history the coca plant was a gift to humanity from the gods. The Incas, the children of the sun, regarded it as sacred. They distributed it among themselves to satisfy the hungry, provide the weary and fainting with new vigor, and cause the unhappy to forget their misery.

The rest of mankind may be doing itself an injustice if it does less.

RICHARD T. MARTIN

The Role of Coca in the History, Religion, and Medicine of South American Indians

Richard T. Martin has been a research fellow at the Harvard Botanical Museum. *This paper was read before the XI International Botanical Congress, Seattle, Washington, August 1969, and subsequently appeared in* Economic Botany *24 (1970). It represents the clearest and most complete description by a contemporary scientist of the use of coca by South American Indians.*

OF ALL the plants which modern science has adopted from the materia medica of South American Indians, the coca shrub, *Erythroxylon coca* Lamarck of the Erythroxylaceae, is perhaps the most famous. Coca leaves have been widely used in South America as a masticatory and medicine for over two thousand years. The plant is extensively cultivated in eastern Peru and Bolivia between 1,500 and 6,000 feet in the warm, moist valleys of the montaña. On a smaller scale, the plant has been cultivated also in northern Chile, Ecuador, southern Colombia and the Sierra Nevada de Santa Marta, and throughout the Amazon Basin, as well as in many countries in the Old World. Although no examples of truly wild coca are known, the presence of several similar wild species in the montaña region of Peru and Bolivia suggest this as the probable area of origin of the cultivated species. Many distinct varieties of coca are found under cultivation, several frequently occurring in the same plantation. Botanists often regarded certain of these varieties as distinct species, i.e. *E. novogranatense* (Morris) Hieronymus, *E. truxillense* Rusby, and *E. bolivianum* Burck. Since, however, the plant shows great plasticity under different ecological conditions and virtually nothing is known of the genetics of

the plant, it seems best to regard these as cultivated varieties rather than distinct species, until cytological research and hybridization experiments can determine the significance of the variation.

The coca plant is a shrub of approximately one meter in height with a number of striking botanical characteristics. The leaves have very distinctive longitudinal areolate lines curving toward the midrib which are merely thickenings in the epidermal cells resulting from the manner of unfolding of the leaf. At the base of the petiole there are characteristic ovate intrapetiolar stipules. The creamy white flowers are about one centimeter long with five sepals and five petals. Each petal has a distinctive clawed appendage on its inner surface; in the intact flower these unite to form a crown. The 10 slender stamens are basally united into a short membranaceous cupule with short denticulations outside and between the filaments at the rim. The pistil possesses a three-locular superior ovary with a single ovule suspended from each locule. The plant is heterostylous, i.e. the three yellowish green styles may be either shorter or longer than the stamens. In the ripening of the fruit, two of the ovules abort, and the locules are obliterated. The fruit is an ovate red drupe with one seed.

The remarkable physiological activity of coca is due primarily to its alkaloids: to date, some 14 alkaloids have been isolated from varieties of the coca plant. The alkaloids belong to the tropane series, together with atropine and scopolamine from the Solanaceous genera *Datura, Hyoscyamus, Atropa*, etc. The coca alkaloids are a mixture of ecgonines, tropeines and hygrines. The ecgonine derivatives include cocaine (methyl benzoyl ecgonine), methyl ecgonine and cinnamyl cocaine; the tropeines include tropeine and pseudotropine, dihydroxypeine, tropacocaine and benzoyltropane; the hygrines include hygrine, hygroline and cuskohygrine. The stereoisomers a- and b- truxilline have also been isolated from coca leaves, and nicotine has been reported.

The isolation of cocaine from coca leaves by Niemann of Göttingen in 1860 and the discovery of its application in local anaesthesia by Dr. Carl Koller in 1884 constituted major advances in the science of pharmacology, and gave the coca plant and its derivatives an important place in the development of modern medicine. However, the discovery of cocaine had another less beneficial effect on the reputation of the coca plant; for the occasional abuse of this alkaloid, particularly among persons already addicted to opiates, which was sensationalized by the press both in Europe and the United States at the end of the 19th Century, created the erroneous fear that coca equalled opium in its perniciousness and its deleterious effect on physical and mental health. In the space of 20 or 30 years, coca went from high praise by kings, popes, artists and doctors as the most beneficial stimulant tonic

known to man to vigorous condemnation as a dangerous addictive narcotic. The effect of this prejudice and the subsequent legal ban on coca leaves in Europe and the United States was to halt experimentation with and use of coca leaves by doctors; only specialized uses of cocaine in anaesthesia were regarded as acceptable. Even more serious, however, is the fact that confusion about the effects of crude coca leaves and those of cocaine has caused many people to regard the chewing of coca leaves as practiced by the Indians of South America as merely an addictive vice, with the lamentable result that coca is now being suppressed even in areas where the Indians have relied on its stimulating and medicinal properties for thousands of years, and where it has formed a significant part of their religious and cultural heritage.

My purpose here is to review briefly the importance of coca leaves in the lives of South American Indians with particular emphasis on its role in indigenous medicine and religion. Only appreciating the use of coca from the point of view of the Indians' cultural heritage, their beliefs, and the necessities of their daily lives can give a proper perspective on the meaning of coca to these people. In examining the literature on coca, one notices the fact that those authors—scientists and laymen alike—who have spent time living, working and making friends with the Indians have been the most ready to emphasize coca's beneficial effects and lack of serious deleterious effects, which in many cases they corroborated by personal experiences with the drug; on the other hand, the most derogatory and condemning reports have come from travellers like Poeppig, who admitted his distaste for Indian customs, or from officials and doctors who have had little, if any experience with Indian life.

Perhaps the most ancient use of coca in South America is its employment in various shamanistic practices and religious rituals. As is the case with tobacco, the Indian medicine man valued coca specifically for its narcotic effects; the mild mental excitation which follows the mastication of the leaves enabled him to enter more easily into a trance state in which he could communicate with the spiritual forces of nature and summon them to his aid. The Indians' spiritual practices of fasting, meditation, incantations and dancing appear to be in every way analagous to similar shamanistic and religious practices found in the Old World.

This power of coca to enhance the effectiveness of meditation and incantations and to produce trance states is responsible more than any other factor for its reputation as a divine plant. The religious importance of coca is seen even in the earliest evidences for its use. Mochican pottery from the Classic Epoch of the northern coast of Peru (around A.D. 500) contains numerous examples of painted scenes of

coca chewers and molded vessels showing the characteristic distended cheeks of coca chewers which indicates that coca was used by persons of high rank, probably priests. The Incas regarded coca as the most sacred of plants, as a "living manifestation of divinity, and the place of its growth a sanctuary where all mortals should bend the knee." [1] Garcilasso Inca de la Vega, an early chronicler of mixed Spanish and Incan ancestry, recounts the legend that the children of the Sun presented the Incas with the coca leaf to satisfy the hungry, provide the weary and fainting with new vigor and to cause the unhappy to forget their miseries. Under the Inca Empire, the use of coca was restricted largely to the nobility and priests; a gift of coca was considered one of the highest marks of imperial favor. At the *huaraca,* or initiation ceremony for young Inca nobles, the young men competed in foot races, while young maidens stood along the course offering coca and chicha and crying, "come quickly youths, for we are waiting." [2] At the end, each youth was invested with a *huaraca,* or sling, and the *chuspa* filled with coca leaves to symbolize his new manhood. Coca was also presented to the nobles of newly conquered tribes when they were assimilated into the empire. All of the records, traditions and history of the Inca empire were handed down by court orators, or *yaravecs,* individuals with phenomenal memories who related the history of the race in detail at royal councils, aided only by a system of knotted strings, the *quipu.* The *yaravecs* were permitted the use of coca to strengthen their capacity for recollection; this tradition stands in contrast to some modern authors who have claimed that coca retards the memory and dulls the intelligence. Special sacrifices of coca were made at Incan ceremonies at the Temple of the Sun in Cuzco, and it was considered essential that supplicants should approach the altar only when they had coca in their mouths. As the most important vegetal offering, coca was sacrificed at virtually all religious festivals, the leaves being thrown to the four cardinal points or burnt upon the altars. Coca was also frequently used for purposes of divination; the Incas believed in consulting supernatural powers before undertaking any important action. Frequently diviners would chew coca leaves and spit the juice into their palms with the two longest fingers extended: if the juice ran down both fingers equally the augury was good; if unequally, it was bad. Other diviners would burn coca leaves with llama fat and watch the way in which they burned.

Following the destruction of the Inca empire by the Spaniards, the use of coca became much more general among the masses; nonetheless,

1. Unanue, 1794.
2. Mortimer, p. 70.

it retained its place as the divine plant and has been used by the Quechua Indians in all offerings and religious rites up to the present time. When a pack train is ready to depart, the Indians throw coca in the air to propitiate the gods of the mountain and ensure a safe trip. Piles of sacred stones, originally dedicated to *Apachic* or *Pachacamac,* now with rude crosses placed on them by missionaries, are scattered along the paths in dangerous mountain passes; as an offering and to ask for continued strength and endurance, the Indian will throw his quid of coca against the rocks. Coca is also periodically offered to the earth mother to ensure good crops or before inserting the corner stones of a new house, and a young man frequently takes offerings of coca to a girl's parents to obtain their consent for marriage. In graves where mummies are found, there is always a supply of coca in *chuspas,* and frequently a quid has been placed in the mouth of the deceased to give him strength on his journey. Poeppig relates a common Indian belief that, if a dying man can appreciate the taste of coca leaves pressed to his lips, his soul will enter paradise.

Coca was equally important in the spiritual life and religious rituals of many other groups of Indians, particularly among the Chibcha of Colombia and the Aymara of Bolivia. Among the Chibcha, coca was used by the priests (*cheque*) for divining. After 12 years of training, a *cheque*'s ears and nose were pierced and he was invested by the ruler with a pointed mantle and a calabash container for his coca. Among the Aymara, coca is chewed at all ceremonial occasions such as marriages and wakes. When a new headman of an *ayllu* or district is introduced by his predecessor, he takes a drink and a pinch of coca with every household head. The chief method of divination among the Aymara is through the medium of coca. Coca divination is practiced not only by diviners (*yatiri*) but also by black magicians (*laiqa*), white magicians (*paq*) and healers (*qolasiri*).

The most accurate and complete account of the religious uses of coca among modern Indians is Reichel-Dolmatoff's report on the significance of coca among the Kógi, a group of Indians of the Sierra Nevada de Santa Marta which has been sufficiently isolated to retain many tribal traditions. Among the Kógi the use of coca is restricted to the males. After the evening meal, the men either retire to meditate and chew coca or they go to the ceremonial house to chew coca and spend the night dancing, chanting, and having ceremonial conversations with "Los Antiguos." Reichel-Dolmatoff's account gives a clear description of their motives for chewing coca: "Upon the effect of the coca, the Kógi emphasizes in the first place that its consumption brings a certain mental clarity which one ought to take advantage of for ceremonial gatherings and any religious act in general, being conversations, per-

sonal rites, or group rites. Evidently the coca causes a euphoric state which lasts for a long period and is prolonged by the gradual consumption of larger and larger quantities. The individual turns into an animated speaker, and says that he feels an agreeable sensation of tingling over all the body and that his memory is considerably refreshed which permits him to speak, sing, and recite during the following hours. In the second place the Kógi say that coca appeases hunger. According to them, however, this never is the object of consuming coca but only an agreeable consequence, seeing that during the ceremonies or ceremonial conversations the consumption of food is prohibited and the assistants ought to fast. Another effect which is attributed to the coca is insomnia. Here again the Kógi see an advantage since the ceremonial conversations should be carried on at night and individuals who can speak and sing for one or several nights without sleep, merit high prestige. The Kógi ideal would be to never eat anything beside coca, to abstain totally from sex, to never sleep, and to speak all of his life of the 'Ancients,' that is to say, to sing, to dance and to recite." [3]

The utilization of coca leaves by Indian laborers and travellers to reduce muscular exhaustion and alleviate hunger and thirst has been widely reported by various authors, and is perhaps the most widely known of the uses of coca. The Incas recognized coca's power to increase endurance, and the *chasquis* or relay messengers and the soldiers were enabled to endure incredibly long marches at high speed by chewing coca. The Spaniards were likewise quick to recognize this capacity of the drug since it enabled the Indians to perform more work with less food; unfortunately, the mine and plantation owners too frequently abused this property of coca and forced the Indians to work unbelievably long hours—up to forty-eight hours at a time—without adequate nourishment or rest. The Indians of the Peruvian Sierra are famous for their ability to travel rapidly along mountain paths with heavy burdens, sustained only by an occasional *acullico* or chew of coca. The Sierra Indians are even accustomed to measuring the length of a journey by the hours that one chew of coca will sustain them in their journey—a period of time called the *cocada*. The *cocada* is more a measurement of time than distance; the first influence of the leaves is felt within ten minutes, and the effect lasts about 45 minutes in all, during which time the Indian will cover about three kilometers on level ground or two kilometers going uphill. Lloyd, in his study on the use of coca by the Momberos of Colombia, describes the incredible endurance of Indian porters near Popayán: "After eating a simple breakfast of ground corn porridge they would start with

3. Reichel-Dolmatoff, I. pp. 77–78.

their heavy packs, weighing from seventy-five to more than one hundred pounds, strapped to their backs. All day long they travelled at a rapid gait, over steep mountain spurs and across mucky swamps, at an altitude that, to us, without any load whatever, was most exhausting. On these trips the Indians neither rested anywhere, nor ate at noon, but incessantly sucked their wads of coca throughout the entire day. These Indians we found very pleasant, always cheerful, happy, and good natured, in spite of the fact that their daily toil subjected them to the severest of hardships and the most frugal fare." [4] An even more impressive account of endurance sustained by coca is given by von Tschudi: "A Cholo of Huari, named Hatun Huamang, was employed by me in very laborious digging. During the whole time he was in my service, viz. five days and nights, he never tasted any food, and took only two hours sleep nightly. But at intervals of two and a half or three hours, he regularly masticated about one half an ounce of coca leaves, and he kept an *acullico* continually in his mouth. I was constantly beside him, and therefore I had the opportunity of closely observing him. The work for which I engaged him being finished, he accompanied me on a two days journey of twenty-three leagues across the level heights. Though on foot he kept up with the pace of my mule, and halted only for the *chaccar*. On leaving me, he declared that he would willingly engage himself for the same amount of work, and that he would go through it without food if I would but allow him a sufficient supply of coca. The village priest assured me that this man was sixty-two years of age, and that he had never known him to be ill in his life." [5]

Coca is equally important in the daily routine of the Indian farmer. The work day of a Quechua Indian during plowing time begins at dawn, when he meets the members of his work party, and they sit together on the ground chewing coca supplied by the owner of the plot. Work commences soon after, but is interrupted after an hour for another coca chew. At noon, another break is taken for a brief lunch of chuño, potatoes, and sometimes cheese, followed by more coca. After working until two o'clock, the party stops for another chew of coca; the work day ends at five o'clock, when the members of the party return home. In arguing against the suppression of coca in Colombia, Henri Lehmann emphasizes the importance of coca to the Indian farmers, particularly since their fields frequently lie far from their homes, and the Indians eat usually only at dawn and at the end of the work day.

4. Lloyd, A treatise on Coca, pp. 12–13.

5. Von Tschudi, p. 453.

The process of masticating coca, termed *chaccar,* or *acullicar* in Peru and Bolivia, is essentially the same now as it was in the time of the Incas. The Indian who is preparing to *acullicar* first relieves himself of his burden and makes himself as comfortable as circumstances permit. He then reaches into his *chuspa,* or woven sack for carrying coca, and, with great deliberation and evident satisfaction, he withdraws the leaves one by one, sometimes removing the midrib, and places the leaves in his mouth, chewing and turning them until they form a ball or quid (the *acullico*), which is held between the cheek and the gums.

He then inserts a small moistened stick or needle into a small tin container or more frequently a calabash gourd (known as an *ishcupuru* in Peru and a *poporo* in Colombia), which contains an alkaline mixture, variously known as *llipta, tocra,* or *mambe.* This alkaline substance varies according to regional availability of materials; it may be composed of quicklime, powdered calcareous shells or ashes obtained by burning the stalks of the quinoa plant (*Chenopodium quinoa L.*), the barks of various trees, a woody cactus, or even *Musa* root—the ashes being made into a paste for use. This alkaline mixture is then carefully introduced into the quid of coca leaves, care being taken not to cauterize the lips and mouth, and apparently facilitates the release of the desired active principles. The leaves are kept in the mouth with the lime, while the juice trickles into the stomach: in other words, the leaves are never actually chewed. The average coquero will consume between one and two ounces of coca daily in this manner.

The only significant divergence from this method of mastication is found among the tribes of the Amazon Basin. In this region, the coca leaves, known as *ipadú* in Brazil, are roasted on the mandiocca oven and afterwards ground into a fine green powder in a large cylindrical wooden mortar. Often, a small quantity of tapioca is added to give it consistency, and the finely sifted ashes of the *imbauba* or *yarumo* tree (various species of *Cecropia* and *Pourouma*) are thoroughly mixed with the green powder. An unusual modification of this procedure was observed by Schultes among the Tanimuka of the Igarapé Peritomé on the Rio Apaporis in Colombia. Long slender tubes of the rolled and partly dried leaves of *Ischnosiphon* are tamped half full with small lumps of the whitish resin of *Protium heptaphyllum* March. An Indian then lights the tube and inserts the burning end into the still glowing pile of *Cecropia* ashes; by blowing vigorously on the tube, he causes the balsamic incense to permeate the ashes, imparting a very strong flavor to the ash, which is then mixed with the pulverized coca.

Perhaps the most controversial aspect of the use of coca leaves is the question of its effect on the health of the Indians. The Indians almost universally regard coca as a food, from which they derive actual suste-

nance. On the other hand, many modern observers have assumed that coca acts merely to anaesthetize the sensory feeling of hunger without aiding nutrition in any way, and some have condemned coca as actually producing malnutrition among the Indians. However, the Indians rarely use coca to the exclusion of other food, although they may make use of the ability of coca to allay hunger when food is scarce or unavailable. This is apparent from Weddel's observations in northern Bolivia: "The Indians who accompanied me in my voyages chewed, in effect, the coca during the entire day; but when evening arrived, they replenished their stomachs like starved men, and I can assure that I have seen them often ingest in one meal, as much food as I would consume in two days." [6] The chemical analysis of coca leaves has shown that they are relatively rich in vitamins, particularly vitamin B_1, riboflavin and vitamin C; in fact, chewing approximately two ounces of coca leaves daily (an average dose) will supply almost a daily vitamin requirement, an important point in view of the great scarcity of fruits and vegetables in the sierra.

Even more important than these considerations, however, is the action of coca in enhancing the assimilation of other foods, by increasing the flow of saliva and gastric secretions and giving strength to the muscles of the gastrointestinal tract. Von Tschudi [7] comments that the food of the Indians consists almost exclusively of vegetable substances, especially roasted maize and barley converted by crushing, which they consume without admixture of any other substance. The continued use of this farinaceous food, he maintains, causes severe obstructions which the well known aperient qualities of the coca counteract, and many serious diseases may thereby be prevented. Furthermore, throughout South America, an infusion of coca leaves is regarded as the remedy par excellence for indigestion, stomach ache and stomach complaints in general. Even Indians who do not regularly masticate the leaves frequently possess a few plants for this purpose alone. Cobo,[8] who listed the medicinal uses of coca by indigenous doctors, mentions that the juice of coca comforts the stomach and aids digestion, and that it removes all gas and pains in the side. The decoction of the leaf drunk regularly is reported to be valuable against laxity of the bowels, and the powder of the leaves mixed with salt and egg white was administered in small quantities to dry out and heal ulcers. The decoction of the seed, drunk with bee honey and *yerba*

6. Weddel, p. 531.
7. Von Tschudi, p. 453.
8. Cobo, pp. 476–477.

buena, is mentioned as aiding the relaxation of the stomach and alleviating vomiting.

The coca plant also finds many other uses in alleviating the ills and discomforts of the Indians. Coca has frequently been praised for its beneficial effect on respiration, an important consideration since Peru and Bolivia possess some of the highest inhabited areas of the globe. Dr. Carlos Monge, South America's leading expert on high altitude biology, has noted the direct relation between the frequency of the coca habit and the altitude and emphasizes the important effect that coca has on the physiology of people living at high altitudes. The Indians also administer a coca tea to bring quick relief from the alarming symptoms of nausea, dizziness and severe headache in *soroche,* or mountain sickness, which occasionally results from the low oxygen content of the air and the low atmospheric pressure.

The Indians also consider coca to be effective in preventing infirmities of the teeth and gums. Cobo was among the early chroniclers to draw attention to this application of coca: "Its temperament is hot and dry, with very good stypticity; when chewed regularly, it removes from the teeth all corruption and decay, and makes them white, firm, and strong. It happened to me, that calling one time on a barber to extract a molar, since it pained me very much, the barber said to me that it would be a pity to remove it, since it was good and healthy; and since there was present a religious friend of mine, he counseled me to chew coca for some days. This I did, and with it the toothache left and the tooth remained firm like the rest." [9]

Coca was also widely employed to relieve the pains of rheumatism, headache and external sores. Padre Blas Valera reports that "Coca protects the body from many ailments, and our doctors use it in powdered form to reduce the swelling of wounds, to strengthen broken bones, to expel cold from the body or prevent it from entering, and to cure rotten wounds or sores that are full of maggots." [10] Ruiz, a botanist who did extensive travelling in Peru and Bolivia, mentions that "the natives apply the concoction of this plant with salt in hot baths for oedematous and gouty swellings and for pains in the side; and to relieve the head they take hot infusions of this plant as an aperitive and diuretic remedy to banish gloomy and melancholy choler, to clear the spleen, and to diminish obstructions." [11] Cobo also mentions the use of powdered coca mixed with salt and egg white to

9. Cobo, p. 476.
10. Garcilasso, p. 509.
11. Ruiz, p. 198.

consolidate and repair fractures and disintegration of bone and to relieve painful sores. Furthermore, he relates that the Indians say that the seed of coca, taken in vapor, checks all flow of blood from the nose, while the powder of the leaves, mixed in the proportion of two parts powdered coca to one part sugar, is employed to relieve asthma and hoarseness of the chest. Markham also relates that, among *Cinchona* collectors in the forests of Bolivia, coca was more highly valued as a remedy for malaria than the specific which they were engaged in collecting.

Sergio Quijada in his study on the importance of coca in Indian customs relates several interesting medicinal uses of the plant. For irritation of the eyes, masticated coca is placed as a poultice on the eye during the night; in the morning the eye is washed with lukewarm water of roses or chamomile. For sore throat, a gargle is made from an infusion of coca leaves mixed with a little salt, while for headache two or three coca leaves are chewed and placed on the temples, where they are held by a piece of white flannel until the leaves have dried.

Finally, coca is prized by the Indians as an aphrodisiac, a restorative of lost vigor, and a means of insuring longevity. The fact that the Incan Venus was represented as holding in her hand a leaf of coca has been regarded by some authors as symbolic of the reputed aphrodisiac virtues of the plant. Dr. Unanue speaks of "certain coqueros, eighty years of age and over, and yet capable of such prowess as young men in the prime of life would be proud of." [12] Reichel-Dolmatoff reports that this aphrodisiac effect is well known among the Kógi, but, that after a long period of time, it appears to have the opposite effect, since the men frequently lose interest in women. However, it is not clear whether this is due to actual physical impotency or to the fact that the demands of their spiritual life have become more important than women. The Indians of the Sierras are, furthermore, noted for their longevity, with ages of eighty, ninety, and one-hundred years being quite common; the Indians attribute their longevity and robust health to the use of coca which enables them to resist disease and prevent bodily decay. Von Tschudi mentions that, in the sierra, Indians frequently live to well over one hundred years and makes the following comment: "Setting aside all extravagant and visionary notions on the subject, I am clearly of the opinion that the moderate use of coca is not merely innoxious, but that it may even be very conducive to health. In support of this conclusion, I may refer to the numerous examples of longevity among Indians, who, almost from the age of boyhood, have been in the habit of masticating coca three

12. Unanue, 1794.

times a day, and who in the course of their lives have consumed no less than 2,700 pounds; yet, nevertheless enjoy perfect health. I allude here to individuals (and such cases are by no means singular) who have attained the great age of 130. Supposing these Indians to have begun to masticate coca at ten years old, and calculate their daily consumption as a minimum of an ounce, the result is the consumption of 2,700 pounds weight in 120 years." [13] I have personally encountered such examples of longevity among coca users in the western Amazon; on the Rio Napo in Peru, I met a Huitoto Indian, reportedly over 120 years of age, who claimed that he had chewed coca since he was three years old and had never been sick a day in his life.

Because of the general skepticism of medical doctors today with regard to herbal remedies, it is doubtful that many modern doctors would be as convinced of the curative properties of the coca leaf as are the South American Indians. However, during the latter part of the 19th Century, when doctors in the United States and Europe were more familiar with herbal remedies, coca preparations were extensively used therapeutically for many diverse disorders, and coca enjoyed wide popularity as the basis for various stimulant-tonic preparations, as anyone familiar with the history of Coca-Cola well knows. Coca was widely valued by physicians for its depurative properties in ridding the blood of waste products of metabolism, particularly uric acid. Coca preparations also were widely employed to treat neurasthenia, nervousness, depression, rheumatism, cardiac irregularities and cardiac weakness, stomatitis, throat infections, asthma and numerous other disorders, and many physicians reported very beneficial results in professional journals. However, even in this period, a prejudice was beginning to form against coca because of rumors of the "cocaine habit." Dr. Mortimer of New York, who employed coca leaves in his practice for nearly 30 years, lamented the reluctance of his contemporaries to recognize the value of coca in the following terms: "That spirit of antagonism which seems rampant at the very suggestion of progress has caused its allies to rehabilitate and magnify the early errors and superstitions whenever opportunity might admit, together with those newer accessions of false premises engendered through shallowness of investigation. Every department of science has been subjected to similar instances of annoyance, though it would appear that medicine is particularly more subject to such influence." [14] The concluding remarks of Dr. Henry Schweig in his article "New Remedies" are very revealing as to the nature of the origin of the

13. Von Tschudi, p. 452.

14. Mortimer, p. 10.

prejudice against coca: "The vagaries and wild delusions of writers (non-professional, of course) for the daily press have done much to poison the popular mind regarding coca, and this often proves a serious drawback to the physician. The few cases in which 'cocaine' has been abused have served as a basis for launching forth a wild and wholesale condemnation of a valuable drug. Not one instance has come to my knowledge in which any preparation of coca, intelligently employed, except the alkaloid, has produced even the faintest toxic symptoms. As well discard morphia, chloral, cannabis indica, and the bromides, for the reason that they count the victims to their abuse by the thousands every year. All potent medicinal agents are placed in our hands to be intelligently and temperately employed, not to excess, and the medical man who would hesitate to call to his aid a medicinal agent for no other reason than it is abused, should be, in my estimation, classed with that horde of fanatics who would interdict the use of alcohol on the ground of its abuse by a small minority of the population." [15]

The reputation that coca use constitutes an addiction only slightly less pernicious than that of opium has remained with the coca leaf and has been the basis for many national and international controls being placed on its distribution and use. Even use of the pure alkaloid cocaine, however, will not produce the same physical addiction as opiates, characterized by the need to increase dosage periodically and by drastic physical withdrawal symptoms. And the distinction between the employment of coca leaves in their crude form by the Indians of South America and the usage of cocaine is even greater. Coca leaves were employed in South America for two thousand years before the discovery of cocaine without producing any marked toxic results. The occasional reports of extreme overindulgence in coca by some coqueros with resulting damage to their physical vigor and mental health represent clearly exceptional cases, and they are certainly not more prevalent than cases of alcoholism and nicotinism in our society. Although an Indian accustomed to chewing coca will, out of preference, return to his habit whenever possible, the Indians of the sierra who are drafted for military service where coca chewing is not permitted do not show any withdrawal symptoms on leaving off the drug. Furthermore, there is no clinical disease which is directly attributable to coca chewing. Although many pathological defects have been suggested as possibly attributable to coca chewing—hyponutrition, ocular disturbances, enlarged thyroid glands and lymph nodes, hepatomegaly, glossitis, stomatitis, and various degenerative stigmata—it remains to be

15. Schweig, Henry, "New Remedies," 1886.

shown which of these conditions, if any, can be attributed solely to the detrimental effects of chewing of the leaf, particularly because, in such cases, it is difficult if not impossible to separate the effects of coca chewing from those of malnutrition, alcoholism, lack of education and social exploitation.

The easiest way to resolve the conflicting reports on the effects of coca use is to recognize the fact that, like any other potent medicinal agent, coca is beneficial when used appropriately and is detrimental when used in excess. Linnaeus considered that a medicine differed from a poison more in its dose than in its nature, and this precept seems applicable to the coca leaf. Another source of confusion is the fact that the effects of the coca leaf often have been presumed to be embodied in the alkaloid cocaine, albeit in a more potent form, with the result that the majority of the physiological research for the last 50 years has been performed solely with cocaine and not with other preparations of coca leaves. However, many physicians have emphasized that the effects of these two are not identical, and particularly that the therapeutic qualities of coca are not represented completely in the active principle cocaine. An important consideration in this regard is that active principles and particularly alkaloids can exert quite different effects when administered as they are naturally combined in the plant than when administered singly in pure form. Very little is known about the physiological activity of the associate alkaloids of the coca plant, and still less about their effects in combination. The necessity of looking into the possible importance of these other compounds is emphasized by the fact that an Indian will frequently reject the bitter coca leaves with the highest percentage of cocaine in favor of the sweeter leaves which are richer in the more aromatic alkaloids. Dr. Henry Rusby, a professor of materia medica sent to Bolivia by Parke, Davis and Co., was among the first to notice this subtle yet important distinction: "It only remains for me to point out that the relative amount of cocaine contained in native coca leaves exerts no influence in determining the Indian's selection of his supply. As a matter of fact, the ordinary conditions to which the leaves are subject during their first two or three months after they are gathered have but little effect on their initial percentages of cocaine. The Indian, however, makes his selection from among such leaves with the greatest care, eagerly seeking the properly dried leaves from some favorite cocal, whose produce is always most readily bought out, and absolutely rejecting other leaves, notwithstanding that the percentages of cocaine may be almost identical." [16]

16. Mortimer, p. 183.

Although physicians may disagree as to the various effects of the coca leaf, the Indian himself is too familiar with its effects to be bothered by this confusion. Centuries of empirical application of coca have taught the Indian the proper uses of the leaf and the appropriate dosage to be taken for the desired effects. Furthermore, since the South American Indian in general does not have access to well supplied pharmacies, he must rely for the most part on his traditional herbal remedies to preserve his health and treat his ills. For the Indian, coca leaves provide the same benefits that aspirin, coffee, tea, stimulants, sedatives, and numerous other medicaments supply in our society.

In conclusion, I will repeat that coca is an integral part of the Indians' way of life, deeply involved with his traditions, his religion, his work and his medicine. To deny the use of coca to the Indians is as serious a disregard for human rights as would be an attempt to outlaw beer in Germany, coffee in the near east or betel chewing in India. The recent attempts to suppress and control the use of coca can be interpreted only as the latest step in the white man's attempt to exterminate the Indian way of life and make him completely dependent on the alien society and economy which has gradually surrounded him. Henri Lehmann has very accurately stated the severity of the problem in the conclusion to his paper, "The Suppression of the Sale of Coca in Colombia": "The prohibition of the sale of coca is a step forward in the Indians' dependence, it is a step toward his complete enslavement. It is the duty of all the Indian Institutes to interfere in the policy of their administrations to the end that such steps shall not be taken, before it is too late. For several years now, the fight against the Indians has taken new forms. With the pretext of liberating the Indian, for example, many communal lands were dissolved, which has permitted the whites to buy up Indian lands and evict the natives. The fight against coca by means of such methods as we have here described, has turned upon the very people it is trying to safeguard." [17]

17. Lehmann, p. 31.

LITERATURE CITED

Acosta, José de. Historia natural y moral de las Indias. Madrid, Ramón Anglés. 1894. (Original: Seville, 1588).

Avila, P. Francisco de. Origen y costumbres de los antiguos Huaruchiri. Anales del Instituto de Ethnologia Americana, VII, 225–260. Universidad Nacional de Cuyo. 1946.

Cieza de Leon. The Incas of Pedro de Cieza de Leon, (trans. Harriet de Onis, edit. von Hagen). University of Oklahoma Press. 1959.

Cobo, El P. Barnabé. Historia del Nuevo Mundo. I and IV, Sevilla, Imp. de E. Rasco, Bustos Tavera. 1890.

De Candolle, Alphonse. Origin of cultivated plants. New York, Hafner. 1959.

Duque Gómez, Luiz. Notas sobre el cocaísmo en Colombia. Boletin de Arqueologia, I, 445–451. Bogota. 1945.

Ernst, Adolph. Del uso de la coca en los paises septentrionales de la America Meridional. Acta Venezolana I, no. 3. Caracas. 1946.

Espinosa Brave, C. A. Informe de la comisión de estudio de las hojas de la coca. America Indígena, XI, 371–372. Mexico. 1951.

Fuentes, Manuel A. Mémoire sur la coca du Pérou. Paris, Lainé et Havard. 1866.

Garcilasso de la Vega. Royal commentaries of the Incas and general history of Peru, I and II, (trans. Livermore). Austin, University of Texas Press. 1966.

Garganta Fabrega, Miquel de. Noticia sobre la coca en el Occidente Colombiano. Revista de Historia, I, 215–232. Pasto. 1942.

Goodman, Louis & Gilman, Alfred. The pharmacological basis of therapeutics. New York, Macmillan. 1960.

Gutierrez-Noriega, Carlos. El habito de la coca en el Peru. America Indígena, XII, 111–120. Mexico. 1952.

Gutierrez-Noriega, Carlos & von Hagen, V. W. Coca—the mainstay of an arduous life in the Andes. Economic Botany, V. 145–152. 1951.

Koch-Grunberg, Zwei Jahre unter der Indianern, Graz. Austria, Akademische Druck — u. Verlagsanstaff. 1967.

Hegenauer, R. Chemotaxonomie der pflanzen, IV, 84–89. Basel, Birkhauser Verlag. 1966.

Henry, Thomas Anderson. The plant alkaloids. Philadelphia, Blakiston Co. 1949.

Holmes, H. L. The chemistry of the tropane alkaloids. IV. Cocaine.

Holmstedt, B. Coca and cocaine. Manuscript.

Lehmann, Henri. Suppression of the sale of coca in Colombia. Boletin Indigenista, IX, 26–31. Mexico. 1949.

Leon, Luis A. Historia y extinción del cocaísmo en el Ecuador. America Indígena, XII, 7–32. Mexico. 1952.

Lewin, Louis. Phantastica: narcotic and stimulating drugs. New York, E. P. Dutton. 1964

Lloyd, J. T. A treatise on coca. Drug Treatise XXVII. Cincinnati, Lloyd Brothers. 1913.

Manske & Holmes. The alkaloids, 204–307. New York, Academic Press. 1950.

Markham, Clements R. A history of Peru. Chicago, Charles Sergel and Co. 1892.

———. Travels in Peru and India. London, John Murray. 1862.

Mariani, Angelo. Coca and its therapeutic application. New York, J. N. Jaros. 1890.

Monardes, Nicholas. Joyful newes out of the newe founde worlde, (trans. John Frampton, edit. Whibley). New York, Alfred A. Knopf. 1925. (Original edition: London, E. Allde. 1596.)

Monge Medrano, Carlos. La necesidad de estudiar el problema de la masticacion de las hojos de la coca. Peru Indígena, III, 131–135. Lima. 1952.

Mortimer, W. Golden History of Coca. New York, J. H. Vail & Co. 1901.

Occhio, Elsa dell'. La coca, el cocaísmo y los problemas de la hora presente. Runa II, 191–197. Buenos Aires. 1949.

Patiño, Victor Manuel. Plantas cultivadas y animales domesticos en America Equinoccial. I–III. Cali, Jmp. Departmental. 1963.

Poeppig, Eduard von. Reise in Chile, Peru und auf den Amazonen Strohme wahrend der Jahre 1829–32. Leipzig. 1839.

Puga I., Mario A. El Indio y la coca. Cuadernos Americanos, X, 39–51. Mexico. 1951.

Quijada Jara, Sergio. La coca en las costumbres indígenas. Huancayo, Peru. 1950.

Reichel-Dolmatoff, Gerado. Los Kógi: un tribu de la Sierra Nevada de Santa Marta, Colombia, I and II. Bogota. 1949, 1951.

———. Report of the commission of enquiry on the coca leaf. U.N. Economic and Social Council. Lake Success, New York. 1950.

Ricketts, Carlos. El cocaísmo en el Peru. America Indígena, XII, 309–322. Mexico. 1952.

———. La masticacion de la hojas de coca en el Peru. America Indígena, XIV, 113–126. Mexico. 1954.

Ruíz, Hipólito. Travels of Ruíz, Pavón and Dombey in Peru and Chile (1777–1788), (trans. Dahlgren). Botanical Series, Field Museum of Natural History. Chicago. 1940.

Safford, W. E. Narcotic plants and stimulants of the ancient Americans. Annual Report of the Smithsonian Institution, 1916. Washington. 1917.

Schultes, R. E. A new method of coca preparation in the Colombian Amazon. Botanical Museum leaflets, Harvard University, 17, 241–246. Cambridge. 1957.

Schulz, O. E. Erythroxylaceae. Das Pflanzenreich IV, 134, Weinheim, H. R. Engelmann. 1959.

Schweig, Dr. Henry. New remedies. New York Medical Monthly, October, 1886.

Spruce, Richard. Notes of a botanist on the Amazon and Andes. London, Macmillan and Co. 1908.

Steward, Julian H. (editor). Handbook of South American Indians I–VI. Washington, U.S. Government Printing Office. 1947–1950.

Towle, Margaret A. The ethnobotany of preColumbian Peru. New York, WennerGren Foundation. 1961.

Tschudi, Johann Jacob von. Travels in Peru during the years 1838–1842, (trans. Ross). London, David Bogue. 1847.

Unanue, Hipólito. Disertación sobre el aspecto, cultivo, commercio, y virtudes de la famosa planta del Perú nombrada coca. Mercurio Peruano XI, 205–250. Lima. 1794.

Uscateguí, M. N. The present distribution of narcotics and stimulants amongst the Indian tribes of Colombia. Botanical Museum Leaflets, 18, 273–304. Cambridge. 1959.

Weddell, H. A. Voyage dans le nord de la Bolivie. Paris. 1853.

Whiffen, Thomas. The north-west Amazons. New York, Duttfiel. 1915.

Yacovleff, E. & Herrera, F. L. El mundo vegetal de los antiguos Peruanos. Revista del Museo Nacional, III, no. 3, 296–298. Lima. 1934.

Coca Experiences

Paolo Mantegazza was the Italian neurologist whose pioneering monograph "On the Hygienic and Medicinal Virtues of Coca" inaugurated the era of scientific investigation into the nature of the coca shrub's properties. Sigmund Freud was strongly influenced by Mantegazza's work. The following key passages from his original paper have been translated for this anthology by Laura Forti and Gina Alhadeff.

COCA INCREASES pulse rate and, above a certain amount (from 100 grains to several drachms),* it produces a transient fever, with increase of warmth and respiration. Under its influence I observed once a temperature of 37.5° C. on the palm of my hand and twice of 38.7° C. under my tongue. During the reaction the face burns and the eyes shine. With a larger dose there are palpitations of the heart, and congestion of the blood in the life centers is evident. Above three drachms I experienced some momentary palpitations, and my feet and hands became cold.

The maximum pulse rate under the influence of coca was 134, while normally it is 65. . . .

As soon as one chews one or two drachms of coca and swallows its juice, one starts to experience a feeling of warmth—I should say fibrilliform—spreading all over the body. Sometimes one experiences a very soft buzzing in the ears. At other times one needs space and would like to run forward as if searching for a wider horizon. Little by little, one starts to feel that the nervous powers are increasing; life is becoming more active and intense; and one feels stronger, more agile, and readier for any kind of work. I observed in someone a state of drowsiness preceding the awareness of strength. The latter effect appeared only upon increasing the dose. If one notes the modifications of con-

* A drachm is an orthographic variation of dram, a unit of weight equaling $\frac{1}{16}$ oz. —Eds.

sciousness in this first state of coca inebriety, one will find that this state is very different from that produced by alcohol. In the latter case the nervous excitement is always followed by movements that are exaggerated or violent, and always irregular; there is a general confusion of thoughts and muscular activity, while in the inebriety produced by coca it seems that the new strength gradually drenches one's organism in every sense, as a sponge soaks itself with water. Thus the delight of the period consists almost completely in an increased consciousness of being alive. Closed in upon one's self, it can be enjoyed without a feeling of being forced to use immediately the increased strength.

The intelligence becomes more active, speech more vigorous; in short, one feels that the intellectual functions are more active. At the same time one feels less suited for mental tasks of a superior level because sensitivity has not increased in the same way and often has even decreased. In this regard, coca acts very differently from coffee and more like opium. . . .

Often I would carry out a task of no importance under the influence of the first doses of coca and find that the task was not enough to give vent to my overexcited mind. But, while my pen would run quickly and impatiently over the paper, I would not be able to either conceive new ideas or imagine a harder or more exalting task that might better suit the exceptional state of my brain.

Someone who takes two to four drachms is seized by the feeling of being isolated from the external world. One also feels deeply joyful and *intensely alive*. All one's muscles become virtually motionless; and the effort of talking is bothersome, because it seems to dispel that warm and peaceful atmosphere that envelops one. But from time to time it seems that the fullness of life is suffocating; one bursts into energetic words or is tempted to exercise muscular strength in different ways. I am naturally unfit for any gymnastic exercise, but I feel extraordinarily agile when I take four drachms. Once I easily jumped upon a high writing table so nimbly and safely that I moved neither the lamp nor any of the books upon it. At other times I felt able to leap upon my neighbors' heads.

But usually these sudden excesses are transient desires, and one falls immediately afterward into a peaceful *soporific* state, in which one might consider staying all day without moving or feeling any desire to wake up. At this level of inebriety one does not lose awareness, but experiences an ideal, perfect laziness. One sighs deeply or laughs madly; it is difficult and confusing to find the words to communicate this experience. Often I have had to speak very slowly, even with long intervals between one syllable and the next.

Some say that after the first doses of coca they experience sensations of heaviness in their heads or actual pain; others feel as if a cloud were surrounding their brains; still others believe their heads are lighter. If one who is not under the influence of the American leaf examines coca users, he will find they are happy and immobile; at times they also smile very stupidly. Some look as if they are sleeping, but they are oscillating in those mysterious regions that separate waking from torpor and sleep.

If one does not continue and goes to bed after the first stages of coca inebriety, sleep comes quite soon. At one moment sleep is very deep, at another, it is interrupted by long intervals of drowsiness accompanied by a singular awareness of well-being. Dreams are often bizarre; they overlap and superimpose very rapidly.

The particular flavor that three or four drachms of coca produces can last for more than a day in some people, but disappears little by little without leaving any trace. Coffee, tea, and maté shorten this state and bring the brain and the nerves back to their usual activity. In America everybody believes that coca can cure drunken states produced by alcohol and vice versa. My many observations have confirmed the former. The very strong digestive power of this leaf eliminates the most uncomfortable complications of alcoholic overindulgence; but, for the moment, I refuse to believe that wine can eliminate the effects of coca, since I have never witnessed this and thus have no valid reason to believe it.

The maximum dose of coca I have ever chewed is eighteen drachms in a day, taking the last ten in the evening, one after the other. It was the only time that I fully experienced the delirium of coca intoxication, and I must confess that I found this pleasure by far superior to all other physical sensations previously known to me.

For the first eight drachms I experienced the usual effects of feverish orgasm, pleasant drowsiness, and a slight headache; but just before reaching ten drachms my pulse rate was 83 and I experienced an indefinable exaltation as I wrote these words in an unsteady hand: "I do not know if it is I holding this pen in hand . . . I speak and hear my own voice resounding as though it were not mine; my hands are cold, I ask to be pinched and the pain I feel is only barely perceptible. It feels as though the parietals are compressing my brain. . . ." A quarter of an hour later my pulse rate had reached 95 beats.

Half an hour later I chewed two more drachms of the leaf, and my pulse rate increased immediately to 120. It was then that I started to have a sensation of extraordinary happiness; I dragged my feet as I walked and I distinctly felt my heart beating. I could not write except with great difficulty.

By the end of the following two hours I felt extremely happy. The heart palpitations had ceased, but my pulse rate remained at 120; I lay in the happiest sensation of a full and active life. A quarter of an hour after having taken the last two drachms I began to shut my eyes involuntarily and the most splendid and unexpected phantasmagoria started to flit before my eyes.

I was at that time fully aware of myself, but I felt isolated from the external world and saw images that were more bizarre and splendid, in terms of color, than could ever be imagined. Neither the brush of the most brilliant painter nor the pen of the fastest stenographer could have transmitted for a single moment those marvelous apparitions, which were tied to each other not by relationships or associations, but through the whims of unleashed fantasy and a rich kaleidoscope.

A few seconds later the phantasmagoric images came with such rapidity and the intoxication was so intense that I tried to describe the fullness of the happiness washing over me to a friend and colleague close by, but I spoke with such vehemence that he was not able to take down more than a few of the thousands of words with which I was deafening him. Shortly afterward I sank into a genuine delirium, the happiest in the world, which did not, however, deprive me of my consciousness in the least. As a matter of fact I kept stretching my arm out to my friend so that he might measure my pulse rate, which was 134.

Some of the images I tried to describe in the first part of my delirium were full of poetry. I sneered at the poor mortals condemned to live in this valley of tears while I, carried on the wings of two leaves of coca, went flying through the spaces of 77,438 worlds, each more splendid than the one before.

An hour later I was sufficiently calm to write these words in a steady hand: "God is unjust because he made man incapable of *sustaining the effect of coca* all life long. I would rather have a life span of ten years with coca than one of 1000000 . . . (and here I had inserted a line of zeros) centuries without coca."

I could not, however, resist the temptation of seeing the phantasmagoria re-enacted, and thus took two more drachms of coca, which I chewed avidly. The images reappeared, but I was overwhelmed by them, as in a nightmare; and they were terrible—filled with ghosts, skulls, and satanic dances and strangulations . . . but gradually they became calmer and brighter till they embodied the aesthetic ideal of art and imagination; in this state of tranquillity I spent three hours without my pulse rate ever being lower than 120.

Three hours of peaceful sleep restored me to life and I was able to go back to my usual activities, feeling ready to undertake the most

intensive study. No one could have guessed from my appearance that I had experienced sensations of a sort of voluptuousness that I had theretofore believed impossible.

I remained under the influence of coca for forty hours, without food and not feeling at all weak. By this experiment I finally understood how the vice of coca intoxication can become uncontrollable and how the Indians on their journeys on foot can still, with the aid of the precious Bolivian leaf, go three or four days without food. What surprised me the most about this experiment was that I did not feel any lassitude or depression even though I felt as though I had, in a few hours, consumed a great deal of vital energy.

On the day following the intoxication, I experienced a pleasant warmth over my entire body and suffered from slight constipation. My digestion was then and afterward excellent.

On another occasion, having chewed coca after dinner, I began to hallucinate after the sixth drachm. This effect lasted for over three hours, in the course of which I chewed two more drachms. Although I was immersed in a state of indescribable bliss, my consciousness was unimpaired and I was able to record some of the bizarre images that passed before my eyes swift as lightning. Here are a few; it should be kept in mind that for each one I managed to transfer to paper I missed ten on account of their rapid succession:

A cave of lace through the entrance of which can be seen, toward the back, a golden tortoise seated on a throne made of soap . . .

A battalion of steel pens fighting against an army of corkscrews . . .

Lightning, consisting of glass threads, piercing a whole Parmesan cheese crowned with ivy and berries . . .

A saffron inkwell from which is born an emerald mushroom studded with rose fruits . . .

A ladder made of blotting paper lined with rattlesnakes from which several red rabbits with green ears come jumping down . . .

Plucked Chinese flowers with burning silver stamens . . .

Looms made of matchsticks upon which cicadas are weaving pine trees made of sulphur . . .*

On the day following this experiment I felt more vigorous than usual, in spite of the fact that that night I had only had one hour's sleep.

* This series of surrealist images may be the type of mental manifestation from which in other cultures oracles were drawn. Coca has been used by the Indians for purposes of divination since antiquity.—Eds.

Coca, Cocaine and Its Salts

William Martindale, the original author of The Extra Pharmacopoeia, *was elected president of the august Pharmaceutical Society of Great Britain in 1899. He seriously suggested that Englishmen should drink coca rather than tea. This advice appeared in his slim, elegant book* Coca, Cocaine and Its Salts *(1886), which went through four editions in ten years.*

Martindale was a man whose authoritative advice could not be taken lightly. From 1883 until his death in 1902 he produced ten editions of The Extra Pharmacopoeia. *Now in its twenty-sixth edition, it is an officially recognized international reference work, found in libraries and pharmacies throughout the United Kingdom.*

AS A BEVERAGE to substitute for tea or coffee, a decoction or an infusion of Coca is worthy of attention at the present time. The Indian use of it in moderation seems to prolong life, without much need of sleep or food, or even the desire for these, although in excess it has, no doubt, a degrading effect. A taste for infusion or decoction of Coca or its pharmaceutical preparations is easily acquired; if a good sample of leaves be used it is not even at first disagreeable.

As the plant admits of easy acclimatisation, and yields annually several crops of leaves, should it come into more extended use it is probable that its cultivation in suitable localities in mountainous parts of India, Ceylon, and Jamaica will prove a profitable enterprise to planters now commencing the growth of it. . . .

Under the influence of Coca . . . it appears that a new force gradually introduces itself into our organism, as water into a sponge. Gubler thinks that as with tea, caffeine, and theobromine, Coca brings to the nervous system the strength with which it is charged in the manner of a *fulminate*, with the difference that it only yields it slowly, not all at once.

MEDICAL USES

Coca has been praised as a nervine and muscular tonic, preventing waste of tissue, appeasing hunger and thirst, relieving fatigue, and aiding free respiration, and as being useful in various diseases of the digestive and respiratory organs. It is said to be specially useful in many forms of asthma, chronic bronchitis, obstinate cough, phthisis, and general debility; in gastric derangements, owing to its slight astringency, it seems to give more tone to the stomach than the mere anaesthetic action of the Cocaine it contains would produce locally; it is recommended for indigestion, gastralgia, gastrodynia, nausea, sickness, distaste for food, is given to relieve pain, nausea, vomiting, or discomfort caused by excess in either eating or drinking or by pregnancy, and as a cure for morphine and alcohol craving. In using it for this in America it is said in some cases to have produced "Coca Craving."

Coca is also said to cause mental exhilaration, to overcome diffidence or bashfulness in company, and to be an excitant of the vital functions. It has been used in melancholia, in cases of inordinate hunger or thirst, such as occur in some forms of diabetes, and in cases of generative debility. Locally, a solution of the extract in water has been used as a pigment in irritated, inflamed, and granular conditions of the larynx and pharynx.

The pastils have been used similarly for loss of voice due to weakness or relaxation of the vocal cords. Topically these preparations act as astringent sedatives without deranging the stomach. Externally, Coca may be made into poultices, or a plaster made with the extract combined with resin or soap plaster may be applied for rheumatism, lumbago, &c. The leaves are sometimes smoked to relieve asthma.

PHARMACEUTICAL PREPARATIONS

Elixir Cocae.—1 in 6 of Simple Elixir.
Dose.—1 to 4 drachms in water is a palatable preparation.

Extractum Cocae Liquidum (*Off.*)
Syn.—Extractum Erythroxyli Fluidum, U.S.
Dose—½ to 2 drachms.

Coca leaves are exhausted by percolation with proof spirit, the second part of percolate concentrated and dissolved in the first portion, and the strength adjusted so that 1 ounce = 1 of leaves; this preparation contains all the properties of the leaf. If freed from the coca wax it is miscible with water and more palatable, and, so purified, if added to port, sherry, or burgundy, in the proportion of half a teaspoonful to a wineglassful (about an ounce to a bottle), it forms an exhilarating mental stimulant.

By distilling off the spirit and concentrating by evaporation, a solid semi-alcoholic preparation is obtained about four times the strength of the above, known as:—

Extractum Cocae

Dose.—2 to 15 grains or more, in pills or pastils.

Infusum Cocae.—1 in 50 of boiling water.

Taken hot like tea with milk and sugar, or with a slice of lemon, it forms a refreshing beverage. In tonsillitis it may be used warm as a gargle.

Pastillus Cocae Extracti, Coca Pastils.—2½ grains of the extract in each.

Dose.—One every two or three hours.

Coca pastils are good; cocaine cured case of asthma of 15 years' standing; recommended for hay fever, spasmodic asthma, and post-nasal catarrh.—M.P.C. ii/85,320.

Vinum Cocae.—About 1 in 8 of Sherry.

Dose.—One to two tablespoonsful, diluted with wine or water. This is strongly medicated, it must contain half a grain of alkaloid in the ounce, else it cannot be sold without a license.

Coca Wine in a more palatable and popular form about 1 in 20 or 30 of a sweet red wine, is also prepared and in doses of a wineglassful it forms an agreeable, exhilarating beverage.

Wine of Coca checks vomiting of irritable stomach.

COCAINE AND ITS SALTS

The curious property cocaine possesses of producing local anaesthesia was even noted by the discoverer of the alkaloid—Niemann, who, so far back as 1860, wrote: "It produces temporary insensibility on the part of the tongue with which it comes on contact" (Watts's Dict., 1st

Edition, i. 1059, *ex* "Ann. Ch. Pharm." cxiv. 215). This interesting fact lay dormant until 1884; Herr Koller, a medical student in Vienna, was led to test the local anaesthetic action of the hydrochlorate of the alkaloid. . . .

Uses of Cocaine, and cautions on its employment; a summary of the experiences of fifty-two surgeons in the United States. In minor surgery —is of value in all operations where circulation can be temporarily arrested in order to prevent undue absorption. A fresh solution should be employed, of strength not exceeding 4 per cent. Caution is required when the circulation cannot be controlled. Is of little use as a local anaesthetic in anal work, such as fistula. In genito-urinary surgery must be used with care, as it is in this class of cases that untoward effects have been most marked; the solution should not remain in contact with mucous surface more than a few minutes. In gynaecological work it is of limited service, as general anaesthesia is mostly to be preferred. For ophthalmic surgery, Cocaine is the anaesthetic *par excellence;* in no other department of surgery is its use so widespread and its application so entirely satisfactory. It is suitable for all operations on the eyeball, except iridectomy for acute glaucoma, and enucleation; as it causes dryness of the epithelium it should not be used long prior to operation. Is of great value in nasal, aural, and throat operations.—Th. Gaz. Aug. 1891, 518.

COCAINA, Cocaine

Dose.—$\frac{1}{20}$ to 1 grain, in a pill or tablet.

As pure Cocaine (the alkaloid) is soluble in fats and oils, and its salts are not, it should always be used when it has to be combined with fatty or oily substances, for use externally, e.g.:—

Bougies of Cocaine. ½ grain each or more, with cacao-butter.
Are useful in painful affections of the urethra.

Ceratum Cocainae. 1 in 30 of petroleum cerate.
Is useful in burns, scalds, urticaria, pruritus, &c.

Collodium Cocainae. 2 per cent in flexible collodion.
Allays the itching, and is a cure for inflamed chilblains.

Emplastrum Cocainae. 1 dissolved in 50 of lead plaster heated in a water bath.
Useful for intercostal neuralgia, sciatica, tender corns, bruises, &c.

Oleatum Cocainae. A saturated solution of the alkaloid in oleic acid: heated, one part will dissolve in two parts of oleic acid; it may be further diluted with oleic acid or oil. Has not proved so satisfactory a preparation as

Oleum cum Cocaina. A 2 per cent solution, more or less, if ordered, in almond oil, is mostly used. This is useful for earache. For the eye a 2 per cent solution in castor oil is used; for catheters, a solution in equal parts castor and almond oil does well, it is viscid, and does not congeal in winter.

Suppositories and **Pessaries of Cocaine** have ½ grain (or more, if ordered) in each with cacao-butter.

Tabellae Cocainae, Cocaine Tablets. $\frac{1}{20}$ grain in each, with chocolate (or more, if ordered).

Dose.—1 every quarter, half-hour, or hour, quickly eaten and swallowed. Useful for sea-sickness, chloroform or alcohol sickness, sickness of pregnancy, &c.

Unguentum Cocainae. 1 in 30 of lard or lanoline (more or less, if ordered). Cocaine is soluble 1 in 2 of anhydrous lanoline if gently warmed.

Useful where absorption is required, as in facial neuralgia, shingles, eczema, erysipelas, urticaria, and pruritus.

Vaselinum Cocainae. 4 per cent (more or less, if ordered).

Suitable for the eye; is very bland; also for smearing catheters, burns, scalds, &c.

Cocainae Citras, Citrate of Cocaine.

Dose.—$\frac{1}{20}$ to 1 grain or more. Is in deliquescent small white crystals; used by dentists.

Cocainae Hydrobromas, Hydrobromate of Cocaine.

Dose.—$\frac{1}{20}$ to 1 grain, in a pill or solution. Is a stable salt, in odourless, small, white, hard, acicular crystals.

Cocainae Hydrochloras, Hydrochlorate of Cocaine (*Off.*)

Off. Dose.—$\frac{1}{5}$ to 1 grain, but less and more may be given, in aqueous solution, pill, or pastil.

This salt has been most used: if pure it is in hard, colourless, short, acicular, granular-looking crystals, or, now more frequently met with, in light, shining, lamellar crystals, free from odour and almost tasteless; being soluble in half its weight of water, the tingling numbness and local anaesthesia which it produces on the tongue are more intense than that produced by pure cocaine.

Buginaria Cocainae Hydrochloratis, Nasal Bougies of Hydrochlorate of Cocaine.

One-sixth of a grain in each with gelato-glycerine basis. Useful in

hay fever, sometimes combined with $\frac{1}{120}$ grain of Sulphate of Atropine in each.

Injectio Cocainae Hydrochloratis Hypodermica. 1 in 20.

Dose.—2 to 10 minims. For sciatica and many local affections acts better than morphine.

Hypodermic Lamels are prepared containing $\frac{1}{4}$ grain in each.

Lamellae Cocainae, Discs of Cocaine (*Off.*)

Discs of gelatine, each containing $\frac{1}{200}$ grain of hydrochlorate of Cocaine. These should be prepared in an atmosphere carefully freed from dust and germs of fungi and disease. Also prepared containing $\frac{1}{50}$ grain in each, and in combination with Atropine, Homatropine, and Physostigmine.

Liquor Cocainae Hydrochloratis (*Off.*) 10 per cent. Solution of Hydrochlorate of Cocaine.

Dose.—2 to 10 minims. Hydrochlorate of Cocaine 100, Salicylic Acid $1\frac{1}{2}$, Boiling Distilled Water to produce 1,000 fluid parts when cold.

Pastillus Cocainae Hydrochloratis. $\frac{1}{20}$ grain in each (to $\frac{1}{10}$ or $\frac{1}{5}$ grain, or more if ordered).

Useful in allaying irritation of the throat and hoarseness. They invigorate the vocal organs of singers and public speakers.

Pastillus Cocainae et Morphinae contains $\frac{1}{30}$ grain Cocaine and $\frac{1}{60}$ grain morphine. Useful for coughs.

Pilula Cocainae Hydrochloratis. $\frac{1}{5}$ grain in each (or more, if ordered), with sugar of milk and syrup q.s. to make a grain pill.

Tabloids of Hydrochlorate of Cocaine. $\frac{1}{10}$ and $\frac{1}{6}$ grains each are prepared for hypodermic injection.

Trochisci Cocainae Hydrochloratis. $\frac{1}{12}$ grain in each. Used for similar purposes to the pastils.

Cocainae Phenas, Carbolate of Cocaine.

Dose.—In pill, $\frac{1}{5}$ to 1 grain. A slightly soluble pasty compound, used by dentists and given for gastralgia.

Cocainae Salicylas.

Dose.—$\frac{1}{5}$ to 1 grain or more.

Is in minute snow-white crystals, slightly deliquescent, and is recommended for the use of oculists, as it forms a solution which keeps well.

In spasmodic asthma the hypodermic injection of a good dose (6 grains) at the beginning, relieves the attack.—B.M.J. ii./86,117.

Cocaine and its salts, although selling at one time as high as 3s. 6d. per grain, are now reduced to a very moderate price.

Tropacocaine, BENZOYL-PSEUDO-TROPEIN.

An alkaloid obtained from Java Coca. Is almost insoluble in water, the Hydrochlorate is freely soluble.

Is a powerful anaesthetic; in the eye causes neither ischaemia nor irritation or hyperaemia. Anaesthesia quicker than cocaine, but more transitory; the action may be kept up by adding a drop from time to time. Mydriasis occurs occasionally, but slight. No harmful symptoms observed in any case. Injection into gums in large doses only affected pulse for 10 minutes, and did not affect respiration.—L.i./93,278. Employed where it is desired to produce anaesthesia without dilatation of the pupil.—L.ii./94,335.

The Divine Plant of the Incas

William Golden Mortimer was editor in chief of the Pharmaceutical Journal *in New York. After graduating from medical school in 1885, he became a surgeon at Blackwell's Island Hospital, and edited the* New York Journal of Medicine. *The following material has been condensed from his massively detailed monumental classic* Peru: History of Coca, *published in 1901. This carefully researched encyclopedic investigation summed up everything then known about coca and cocaine.*

THIS WORK, although of a scientific nature, has not been written exclusively for scientists, for the theme is of so universal a scope as to be worthy the attention of all who are concerned in lessening the trials of humanity.

Centuries before the introduction of cocaine to anaesthetic uses, the world had been amazed by accounts of the energy creating properties ascribed to a plant intimately associated with the rites and customs of the ancient Peruvians, and first made known through the chroniclers of Spanish conquest in America. The history of this plant, known as Coca, is the history of the Incan race and is entwined throughout the associations of the vast socialistic Empire of those early people of Peru. The story of that remarkable people has been adequately told through the voluminous writings of a host of historians. But the true story of Coca, which the Incas regarded—because of its property of imparting endurance—as the "divine plant," has hitherto never been fully set forth. Indeed, the "authoritative" literature of Coca—such as contained in text books—is so filled with inaccuracies and contradictory statements that the opinion of a reader seeking information from such a source, must fluctuate between the account he might last have read and some former utterance which was diametrically opposite in conclusion.

As a result of this want of knowledge, much that has been supposed must be forgotten before the mind can be receptive for the truths of Coca which are built upon facts.

The facts all indicate that the action of Coca is so unique and subtle that it cannot be judged by comparison with any other natural product similarly employed. This truth is embodied by Dr. Searle in the following statement:—"It is not a little remarkable that while no other known substance can rival Coca in its sustaining power, no other has so little apparent effect. To one pursuing the even tenor of his usual routine, the chewing of Coca gives no especial sensation. In fact the only result seems to be a negative one, viz: an absence of the customary desire for food and sleep. It is only when some unusual demand is made upon mind or body that its influence is felt. And to this fact is to be attributed much of the incredulity of those who have carelessly experimented with it and who, expecting some internal commotion or sensation, are disappointed." * Just why this is so cannot be briefly told. It is for this reason that the associations, the necessities, the uses and the characteristics of the plant are here so fully discussed.

That Coca has not only not been well known, but barely known indirectly among a majority of those who presumably should know it—physicians who should use it, and teachers who should instruct as to its properties—is emphasized by the result of an inquiry instituted for the purpose of compiling a collective investigation. Upward of ten thousand letters were sent to a representative class of practitioners and teachers, and a majority of those from whom replies were received wrote in a frank way that they knew absolutely nothing about Coca. Others had not employed it because they believed it to be inert through a confusion of its name with cocoa, or from confounding it with other products. A few, more liberal, expressed a belief that a substance with such traditional qualities as those surrounding the "divine plant," was probably possessed with properties which when better understood, might be made a valuable boon to humanity.

The present work has been constructed in view of these contradictions and uncertainties, and undertakes to trace the associations and uses of Coca, from the earliest accounts which are to be found. The story which necessarily commences with the dynasty of the Incas, embodies sufficient of the doings and the trials of that mighty Empire and its overthrow by the Spanish, as is essential to show the intimate connection between those people and the history of Coca. This has been epitomized from sources of authority and tells of the industries, science, arts, poetry, dramas, laws, social system and religious rites

* Searle, p. 123, 1881.

of the Incas as gleaned from tradition and witnessed in their relics, through all of which is interwoven the uses and applications of Coca. The history of that people is sufficiently full of life and color to absorb profound admiration. To this is added the accounts of contemporary travellers and scientists who have further detailed the continued dependence of the Andeans upon this Incan plant, and to tell of their own personal uses of Coca to support them under similar trials to those which the Incas experienced, and to which the present Peruvian Indians are still subjected. To a better understanding of the necessities for such support, the physical aspect of the Andes, together with a description of the life and customs of the modern Andeans is given. The characteristics and botanical peculiarities of Coca, and the economic uses of plants of the family to which it belongs are described, and an effort is made to harmonize the early uses of the substance—which are now shown to have been of necessity and not of luxury—with its present employment, through facts of modern physiology. The possible causes which may provoke the energy yielding properties of plants are considered, and are compared with analogous processes in the human body. The chemical problems involved in the study of the products of the Coca leaf and an account of the isolation of its various alkaloids is concisely told, and the possible advantages of Coca to the benefit of nerve, to muscle and to better blood are discussed from the results of careful investigation by a long list of experimenters. The utility of Coca to provoke endurance, its influence in voice production and its adaptability as an adjunct to a popular dietary is suggested.

No effort has been made to make this work in any sense a book of Coca therapy, but a study of the early necessities and the hypothesis here advanced as to the rationale of its empirical uses will doubtless be ample to impress the true status of Coca, and will suggest its application in the affairs of modern life for conditions similar to those which originally demanded it. This is rendered still more practical by a collective investigation on the physiological action and therapeutic uses of Coca among several hundred physicians, which is tabulated in detail.

In the liberal presentation of any complex problem, it is difficult to review all sides of the question without a large accumulation of data. This subject therefore has necessitated the collection of a vast amount of testimony pro and con, which as here introduced forms a compilation convenient for reference. The facts of Coca history are widely separated, through an immense range of literature not readily available to the general reader. Much difficulty has beset the gathering of even the most trivial details, but to build up a work which shall be accepted as authoritative—because embracing the truths of the matter dealt with—has required a deep research and the repeated verification

of thousands of notes. What was collected one day was denied the next; for that reason I have been very precise in quoting my authorities, and the appended bibliography embraces nearly six hundred titles. No attempt has been made to include in this all papers upon Coca, but only those consulted or alluded to in the text. It will be appreciated that this work deals specifically with the parent plant and its several alkaloids and not with merely one of these. A relative prominence is given to cocaine, however, and its physiological action and therapeutic uses is discussed. Cocaine is an alkaloid of Coca that has excited a prodigious amount of writing all over the world; the list of its papers as catalogued in the library of the Surgeon General of the United States Army, between 1885 and 1898, extends over eighteen columns of large quarto pages, printed in small type.

The result of my labor—continued through nearly four years—must now depend upon whether the subject has been treated clearly and made convincing to the reader. As to the value of Coca, there cannot be the slightest doubt. As to its utter harmlessness there can be no question. Even cocaine, against which there has been a cry of perniciousness, is an ally to the physician of inestimable worth, greatly superior—to compare it to a drug of recognized potency, not because of any allied qualities—to morphine. The evils from cocaine have arisen from its pernicious use, in unguarded doses, where used hypodermatically or locally for anaesthesia, when an excessive dose has often been administered, without estimating the amount of the alkaloid that would be absorbed, and which might result in systemic symptoms. Medicinally employed, cocaine in appropriate dosage is a stimulant that is not only harmless, but usually phenomenally beneficial when indicated.

There has been a looseness of interpretation regarding the term stimulant, which has engendered a dread unfounded in fact. There is a vague belief that any substance capable of producing stimulation, first elevates the system and then depresses it by a corresponding fall. The physiological law that stimulants excite to action, and that all functional activity is due to stimulation is forgotten or not generally appreciated. The name stimulant has commonly suggested alcoholics, while alcoholics suggest intoxication and a possible degradation. It recalls a thought of De Quincey when told that an individual was drunk with opium, that certain terms are given too great latitude—just as intoxication has been extended to all forms of nervous excitement, instead of restricted to a specific sort of excitement. As expressed by him: "Some people have maintained, in my hearing, that they have been drunk upon green tea; and a medical student in London, for whose knowledge in his profession I have reason to feel great respect,

assured me, the other day, that a patient in recovering from an illness, had got drunk on beefsteak." *

It will be shown by ample testimony that Coca is not only a substance innocent as is tea or coffee—which are commonly accepted popular necessities—but that Coca is vastly superior to these substances, and more worthy of general use because of its depurative action on the blood, as well as through its property of provoking a chemico-physiological change in the tissues whereby the nerves and muscles are rendered more capable for their work. Strong as may appear this assertion, I believe that the facts here presented will amply indicate that sufficient has not been said upon the benefits to accrue from the liberal use of Coca. Indeed, our knowledge of it is yet in its infancy, and if this present writing will but excite others to continue these investigations and experiments, Coca will achieve the position it should maintain as an aid and support to humanity worthy the greatest popularity and the highest possible respect.

* Confessions.

AN INTRODUCTION TO THE HISTORY OF COCA

"He that has once the "Flower of the Sun,"
The perfect Ruby which we call *elixir,*
. . . . . by its virtue
Can confer honour, love, respect, long life,
Give safety, valour, yea and victory,
To whom he will. In eight and twenty days
He'll make an old man of fourscore a child."
—Ben Jonson, *The Alchemist;* ii. (1610).

If man were asked what one boon he would prefer of all Earth's bounties or Heaven's blessings, his response must be—the power of endurance. The capability to patiently and persistently do best that which the laws of life or the vagaries of association necessitate. Search for this one quality has been the impetus to inspire poet and philosopher since man's first appreciation of his mortal frailty. A something which shall check, within himself at least, the progress of time, the ravages of age, and the natural vacillation of conditions or environment. Wealth, and power, and greatness, and skill, must alike fall into insignificance without this one essential attribute to success. The artist in impressionistic work, the poet in soulful muse, the musician in celestial chords, the soldier in the mad rush of battle, the artisan in the cleverness of device, the merchant in the intricacies of commercial problems—even the most prosaic delver in life's plodding journey—each hopes to display a virility from which the slightest weakness is deprecated as humiliating. Work, indeed, is necessary to existence. It is the price—as the ancients considered—which the gods set on anything worth having. It is the power to do this work -to gain happiness for ourselves, which is the demand of modern necessity. To be enabled to keep active until the human machine may wear out as did the "wonderful one-hoss-shay," rather than rusting into a state of uselessness.

Human endurance, bounded by natural limitations, is still more closely environed by the results of a higher civilization, which presents the remarkable anomaly of two opposite conditions. While increasing, through the refinements of hygienic resources, the average term of life,

it crowds man in the struggle for existence, into a condition where he is rendered less capable physically for fighting the battles into which he is thrust. So, from a natural life of pronounced perfection where his trials have been essentially muscular, he is gradually evolving into an artificial existence of eminently nervous impulse. If this be so, then the interest in any means which shall tend to establish and maintain a balance of force, should not be merely casual, but must be earnest and persistent to any who have regard for life's best qualities, and this interest must constantly increase with the requirements of time.

Even though others may point the way, everyone must fight his own battles. To each of us the world will appear as we may shape it for ourselves—a thought poetically expressed by the composer Wagner, who said: "The world exists only in our heart and conception."

There has been a numerous order of philosophers not content with simple well being, who sought for that perpetual youth—that *elixir vitae*—which might give at least prolonged existence even if not rejuvenation. These did not commence with Faust nor end with Brown-Séquard. Happily the search for this substance—even though originating in a sanguine imagination—has often ended in findings that have been extremely important. Just as when Juan Ponce de Leon sought the *Fontaine de Jouvence* in the Island of Bimini, though he failed to locate the fountain, he did discover a land of perpetual youth, if we may so entitle the ever-blooming peninsula. Possibly it was because of some such spirit of inquiry into the vague depths of the unknown, where was presumed there might be some revelation to this knowledge of a perpetual vigor, which prompted a desire for exploration. Nature has always been ready to answer such seeking by her munificence, which, if not in the direction at first wished, has at least encouraged man to new desires.

The discovery of the Western Continent brought a multitude of bounties to humanity. Among these none is greater than the countless plants which have been gradually unfolded to usefulness by the processes of science. Particularly is this true of the economic and medicinal plants of South America, which on the eastern declivity of the Andes and towards the valley of the Amazon, spring forth in all the luxuriance of the tropical jungle, over a vast portion of which it is supposed the foot of man has never trodden. In this locality—and among this wild profusion, grows a beautiful shrub, the leaves of which in shape somewhat resemble those of the orange tree, but in color are of a very much paler green, having that exquisite translucence of the most delicate fern. The properties of this plant more nearly approach that ideal source of endurance than is known to exist in any other one substance. Its leaves have been used by the natives of the surrounding country

from the earliest recollection, as a masticatory, as a medicine, and as a force sustaining food. Its use is not confined to emergency, nor to luxury, but as an essential factor to the daily life work of these people. As a potent necessity it has been tenderly cared for and carefully cultivated through the struggles, trials and vituperation it has been the occasion of during so many hundreds of years, until to-day its cultivation forms the chief industry of a large portion of the natives and a prominent source of revenue to the governments controlling the localities where it is grown.

During the early age, when this nature's garden was unknown to the rest of the world, the Incas, who were then the dominant people of this portion of the continent, regarded this shrub as "the divine plant," so all important and complete in itself, that it was termed simply *khoka*,[1] meaning the tree, beyond which all other designation was unnecessary. This plant, which has been described under a variety of names but now known as Coca, has appealed alike to the archaeologist, the botanist, the historian, and traveller as well as to the physician. Its history is united with the antiquity of centuries, while its traditions link it with a sacredness of the past, the beginning of which is lost in the remoteness of time. So intimately entwined is the story of Coca with these early associations—with religious rites, with superstitious reverence, with false assertions and modern doubts—that to unravel it is like to the disentanglement of a tropical vine in the primitive jungles of its native home.

Antedating historical record Coca was linked with the political doings of that most remarkable people of early American civilization who constituted the Incan dynasty. Since the conquest of Peru it has continued to form a necessary factor to the daily life work of the Andean Indians, the descendants of this once noble race. So important has it been held in the history of its native land that it has very fittingly been embodied in the escutcheon of Peru, along with the vicuña and the horn of plenty, thus typifying endurance with the versatile riches which this country affords.[2]

The first knowledge to the outer world concerning Coca followed Pizarro's invasion of Peru, though the actual accounts of its properties were not published until some years after the cruel murder of Atahualpa—commonly regarded as the last Incan monarch. The effort made by the Spanish to implant their religion raised the cross and shrine wherever possible, which necessitated the founding of numerous

1. Dr. Weddell suggests Coca from the Aymara *khoka,* a tree, i.e., the tree par excellence, like *yerba*—the plant of Paraguay. The Incan historian, Garcilasso, spells it *Cuca.*—Markham.

2. Marcoy: 1869.

missions, in charge of fathers of the church. These men in holy orders were often as tyrannical as those who bore arms, yet fortunately there were some in both classes less cruel, men of liberal attainments who appreciated the importance of preserving the traditions and records of this new country. To the writings of some of these more kindly disposed personages, as well as to the earnest labors of a few young nobles who were in the army of invasion, whose spirit for a conservative exploration was greater than for destructive conquest, we are indebted for the facts which form the foundation of this early history. Many of these writers had personally seen the result of the Incan civilization before its decay, and had opportunity to collect the native stories, as retold from father to son, through generation after generation, oral tradition being the early Peruvian method for continuing a knowledge of events. Unlike the Mexicans, these people had no picture writings to tell their doings in a series of hieroglyphics, nor had they a written language. But the story of this once mighty empire is told in its wonderful ruins, and through the relics of skillfully moulded pottery, and textile fabrics in exquisite designs, which all indicate a remarkable civilization. Historical facts were related by regularly appointed orators of phenomenal memory, who on all state occasions would recount the occurrences of the preceding reign, being aided in this recital by a novel fringelike record of colored cords, known as the *quipu*. By the aid of this, as a sort of artificial memory, they told, as a monk might tell his beads. The various knots and several colors of the contrivance designating certain objects or events. In all these relations the Coca leaf was repeatedly and reverently alluded to as a most important element of their customs, as well as of their numerous feasts and religious rites.

The Spanish idea of conquest was to establish a complete mastery over the Peruvians; the Indians were to be regarded as slaves to be bought, sold, and used as such. In view of these facts it is not difficult to understand that as Coca was constantly employed among the natives, its use was early questioned and condemned as a possible luxury, for it was not considered a matter worthy of inquiry as to any real benefit in a substance employed by slaves. So superficial were the observations made by some of the early writers that the fact of this neglect is most apparent. Thus, Cieza de Leon, a voluminous writer on Incan customs, mentions as a peculiar habit of the natives: "they always carry a small leaf of some sort in the mouth." Even so experienced an observer as Humboldt, in his writings of many years later, did not recognize the true quality of Coca, but confounds the sustaining properties of the leaf as due to the alkaline ashes—the *llipta*—

which is chewed with it. He refers to the use of this lime as though it belonged to the custom of the clay eaters of other regions, and suggests that any support to be derived from it must necessarily be purely imaginary.

It is not surprising that Coca chewing, if superficially viewed, should be condemned. The Spanish considered it merely an idle and offensive habit that must be prohibited, and at one time it was even seriously suggested that the plants should be uprooted and destroyed. But it was soon seen that the Indians could not work without Coca, and when forced to do so were unequal to the severe tasks imposed on them. As, however, the local tribute to the authorities demanded from all able bodied laborers a fixed amount of work, it was soon appreciated as a matter of policy that the use of Coca must at least be tolerated in order that this work should be done. Then the Church, which was from the invasion an all-powerful force in this new country, exacting and relentless in its demands, saw an imaginative evil in this promiscuous Coca chewing. If Coca sustained the Indians, it was of course a food, and its use should not be allowed before the holy eucharist. Necessity brought forth a deliverer from this formidable opponent, and it was represented that Coca was not an aliment, and so its use was reluctantly permitted.

But now came still another effort to prohibit it, from moral motives. The Indian believed in Coca, he knew that it sustained him without other food in his arduous work, but it had been conclusively shown that it was not a food, and so could not sustain, hence his belief was false, superstitious, even a delusion of the devil to warp the poor Indian from the way he should go. Greed, however, predominated, as gold has ever been a convincing factor, and as the Indian could do most work when supplied with Coca, its use was finally allowed unrestricted, and to-day a portion of Coca is given to all Andean laborers as part of their necessary supplies.

So it will be seen that like all scientific advances which have been made, since Prometheus incurred the wrath of Jove by stealing fire from the gods to put life in mortals, until the present time, Coca has not been admitted to acceptance unassailed. That spirit of antagonism which seems rampant at the very suggestion of progress has caused its allies to rehabilitate and magnify the early errors and superstitions whenever opportunity might admit, together with those newer accessions of false premises engendered through shallowness of investigation. Every department of science has been subjected to similar instances of annoyance, though it would appear that medicine is particularly more subject to such influence. At first a partisan senti-

mentality, with an exaggeration which provokes condemnation and often results in oblivion, or what in calmer judgment may be a true balance of worth.

It is amusing to now look back at some attacks which were hurled against substances that all the world to-day considers as necessities. The anaesthetic use of chloroform was at first regarded as unholy because it was asserted man is born unto pain as he is unto sin, and so should bear his necessary sufferings in a holy and uncomplaining manner. Every physician frequently meets with just such original and plausible opposition to suggested remedies to-day. When in 1638 Cinchona was introduced into Europe under the name of "Jesuits' powder," it was vigorously denounced as quackery. So great was the prejudice that sprang up against it, even among those eminent physicians whom we now look back upon as the fathers of medicine, that when Chiftelius, in 1653, wrote a book against "the bark," he was complimented as though he had relieved the world of a monster or a pestilence.[3] For years it was not countenanced by "the faculty," and the various arguments then advanced concerning its supposed action form curious reading. The opposition to vaccination, in 1770, was something which excited not only the protests of physicians and learned societies, but the clergy and laity as well. The College of Physicians shook its wise head and refused to recognize Jenner's discovery. The country doctor was considered something of a bore.[4] Innumerable other instances might be cited to testify to this negative spirit prompted by any advance.

Among food products, the humble potato when introduced into Scotland, in 1728, was violently denounced as unholy because "not mentioned in the Bible." [5] It was asserted that it was forbidden fruit, and as that was the cause of man's first fall, to countenance its use would be irreligious. In France, so strong was the feeling against the introduction of potatoes that Louis XVI and his Court wore the flower of the plant as a *boutonnière* to give the much opposed—but desirable —potato at least the prestige of fashion. Tea, coffee and chocolate have each been denounced, and from very high sources too. "A lover of his country," as he designated himself, in 1673, proposed to Parliament "the prohibition of brandy, rum, coffee, chocolate and tea, and the suppressing of coffee houses. These hinder greatly the consumption of barley, malt and wheat, the product of our land." Here would seem to be an ulterior motive that is almost suggestive of the commercial

3. Baker; 1818.

4. Russell; 1861.

5. Bell; 1842.

spirit often now displayed, which would suppress one product that another may be permitted to flourish regardless of merit.

As an argument against the pernicious and growing tendency to use tea and coffee, after they had been rendered palatable through knowing how to use them, a Dr. Duncan, of the Faculty of Montpelier, in 1706, wrote: "Coffee and tea were at the first used only as medicine while they continued unpleasant, but since they were made delicious with sugar, they are become poison." [6] The *Spectator* of April 29th, 1712, urges against the dangers of chocolate as follows: "I shall also advise my fair readers to be in a particular manner careful how they meddle with romances, chocolates, novels, and the like inflamers which I look upon as very dangerous to be made use of during this great carnival." Opinion on these beverages is not unanimous to-day even, as harmless as they are commonly considered. Alcohol and tobacco of course have come in for an unusual share of denunciation, and the argument is not yet ended. From these through the entire range of stimulant-narcotics, each has excited such vigorous protests that the very term stimulant is considered by some as opprobrious. How real must be the merit that can withstand such storms of abuse, and spring up, perennially blooming, through such opposition!

Coca is unparalleled in the history of plants, and although it has been compared to about every plant that has any stimulating quality, it is wholly unlike any other. In this comparison tobacco, kola, tea, maté, guarana, coffee, cacao, hashish, opium, and even alcohol, have been referred to. It has been made to bear the burden of whatever evils lurk in any or all of these, and has unjustly been falsely condemned through such association. That Coca is chewed by the South American Indians and tobacco is smoked by the North American Indians, that Coca is used in Peru and opium or betel is used in the East—is a fair example of this comparison. It no more nearly resembles kola—with which it is often carelessly confounded—than through the allied harmony of its first syllable. While a similarity to various substances taken as beverages is possibly suggested through the fact that Coca is sometimes drunk in decoction by the Peruvians.

The cerebral effects of Coca are entirely different from hashish or opium, and its stimulant action in no way comparable to alcohol. I do not mention these substances to decry them, but merely to illustrate the careless comparisons which have been advanced, through which imperfect conclusions must necessarily be drawn.

The fact remains that though Coca is used by millions of people,[7]

6. *All About Coca;* 1896.
7. Ten millions, Anstie, p. 35, 1865, from Von Bibra.

it is not generally known away from its native country. Even many physicians constantly confound it with allied plants of dissimilar properties or with substances of like sounding name. That this is not simply a broad and hasty statement may be illustrated by the following fact. The writing of this work was prompted by the immense divergence of published accounts regarding the efficacy of Coca, in view of which an effort was made to learn the result of its use among a representative class of practitioners, each of whom it was presumed would be well qualified to express an opinion worthy of consideration. An autograph letter, together with an appropriate blank for reply, fully explaining the desirability for this data, was prepared, of which ten thousand were sent out. These were addressed to professors in the several medical colleges, and to those prominent in local medical societies—all eminent in practice. Many did not reply, while of the answers received, fully one half had—"never used Coca in any form." Of the balance, many are—"prejudiced against its use," through some preconceived notion as to its inertness, or through some vague fear of insidious danger which they were not prepared to explain, and even preferred not to inquire into, being—"satisfied it is a dangerous drug."

There are others who inadvertently confound Coca with some of the confusional drugs already referred to or with cocoa. That this was not merely an apparent fault, through some slip of the pen in hasty writing, is shown by direct answer to the question as to the form of Coca found most serviceable, stating so and so's "breakfast *coca*" is used in place of tea or coffee. In some instances the benefits of Coca were enlarged upon with an earnestness that was inclined to inspire confidence. The physiological action was gone into minutely and its therapeutic application extolled, only to conclude with the amazing statement that the fluid extract, the wine, or "breakfast *coca*" were interchangeably used, thus displaying a confusion worse confounded which might be amusing if not so appalling.

These confusional assertions display one source of error, yet in view of the entwined facts concerning Coca through literature and science it must emphasize the unfortunate neglect of observation, and the refusal to recognize advancement manifest even in this progressive age—among some whom duties and responsibilities should have spurred to a refinement of discernment. It is suggestive of the anecdote told by Park, who when in his Eastern travels asked some Arabs what became of the sun at night, and whether it always was the same sun, or was renewed each day, was staggered with the reply—"such a question is foolish, being entirely beyond the reach of human investigation." [8]

8. Sir John Lubbock.

Replies fully as surprising were received in this inquiry. Several have taken the "moral" side of the question quite to heart, and expressed a belief that through advocating the popularizing of Coca, I was tending to contribute to the increase of a pernicious and debasing habit which was already undermining the morals of the community. Others again have tried to show me the error I had fallen into when speaking of the dietetic uses of Coca. As one gentleman emphatically expressed it: "This is some terrible mistake, you are confounding Coca with Cocoa! Cocoa is used for food, but Coca—*never*." So that even that part of my investigation pursued among modern medical men has not been as easily carried out as might at first be supposed. There has been the same or similar ignorance and error to sift apart from truth as encompassed the early historical associations of the plant.

This unfortunate confusion is probably to be accounted for because Coca was largely used empirically and without a proper appreciation of its physiological action before its properties were fully known. Writers who have described its local use among the Andean Indians have advanced statements regarding its sustaining qualities which have not been verified by some observers elsewhere located, even though these latter may have carried out a careful line of physiological experimentation. The explanation of this has only recently been determined, but is now known to be due to the extreme volatility of the associate principles of Coca.

Recent, or well cured and properly preserved Coca is wholly different from leaves which have become inert through improper treatment. Then again as our botanical knowledge of this plant has increased, it has indicated that not all leaves termed Coca are such. The family to which the classic leaves of the Incans belong has many species. Among the particular species of Coca there has only quite recently been determined several varieties. The properties of these differ materially according to the presence or absence of certain alkaloidal constituents. Some of the early experiments upon the properties of Coca were made at a time when these facts were unknown, and with this, was the added disadvantage of the impossibility of then obtaining appropriately preserved Coca in the open markets. Not only may the substance examined have been inert, but through different observers using different varieties of Coca the conclusions could not possibly agree. Unfortunately because of the apparent carefulness of research these early statements were accepted and given a wide publicity, and so from the marvelous apparent benefits of Coca among native users to the absolute inertness pronounced by some foreign observers, there has been a very wide space for the admission of much distrust. The busy physician must commonly accept the result of the

provings of the experimentalist, and amidst so much doubt it may have seemed easier to set aside a possible remedy than to have personally verified the assertions. Indeed, trial has only too often depreciated hopes from a happy realization of the wonderful properties attributed to the use of native Coca on the Andes, to a realization of the uncertainty of the marketed product at command. In which connection it may not seem too astonishing to say I know of an instance where senna leaves were sold by a wholesale drug house for "fresh Coca leaves," while I doubt if any drug house would make a distinction in offering the casual purchaser any variety of Coca at hand.

It was because of "this uncertainty"—of the conflicting stories and the impossibility to unify facts—that interest in Coca, which had been stimulated in Europe by Dr. Mantegazza about 1859, soon declined until disuse almost left it in forgetfulness. About this time Niemann, then a pupil of Professor Woehler, isolated the alkaloid cocaine from the leaves, and attention was again awakened to the possible usefulness of the parent plant. It was supposed, however, that the active principle to which all the sustaining energy of Coca was due had been discovered in cocaine. Here again was a radical error, and an unfortunate one as it has since proved, to still more confound an intricate problem. This is particularly serious because it is widely accepted as truth, not only among many physicians, but also because it has been spread by this misunderstanding through the secular press, and so falsely impressed the laity. As a result, cocaine has been promiscuously used as a restorative and sustainer under the supposition that it is but Coca in a more convenient and active form. The evils which have followed this use have fallen upon Coca, which has often been erroneously condemned as the cause. It is owing to the wide spread of this belief as well as its resultant evil and because of the difficulty for the lay mind to appreciate the radical difference between Coca and cocaine—between any parent plant and but one of its alkaloids—that it must necessarily require long and persistent effort on the part of educated physicians to explain away this wrong, to reassure those who have been falsely informed as to the real merits of Coca, and so reflect credit upon themselves through the advocacy and use of a really marvelous remedy.

The truth cannot be too forcibly impressed, that cocaine is but one constituent, and no more fully represents Coca than would prussic acid—because found in a minute quantity in the seeds of the peach—represent that luscious fruit. In emphasizing this a recent investigator who passed a long period in the Coca region, studying as a scientist the peculiarities of the plant, and watching as a physician its effect upon native users of the drug, says: "With certain restrictions it may

be said that the properties of cocaine, remarkable as they are, lie in an altogether different direction from those of Coca as it has been reported to us from South America." [9] So it will be seen that because of misconstruing early tales and superstitious beliefs, because inert leaves have not yielded results of the sound plant, because some different variety has not yielded the same results as the classic type, because one of its alkaloids does not represent the whole, the parent plant is condemned. Because of this ignorance of certain investigators the historical accounts of the use of Coca and its sustaining qualities among the natives, have been set down to exaggeration or absolute fabrication. As one physician replying to my inquiries would have others believe: "The Indians are great liars." Thus from ignorance, neglect or from false conception, Coca was either wholly ignored or little understood in a popular way, until in 1884 a renewed interest was awakened through the discovery of the qualities of cocaine as an anaesthetic in the surgery of the eye. Then, as though forgetful of all preceding investigation or condemnation, a renewed discussion commenced regarding the asserted qualities of Coca, the failure to realize them, and the probable source of potency of the plant as represented by cocaine.

This was followed by frequently reported accounts of a new and terrible vice which was springing up everywhere—the so-called "cocaine habit." For this Coca was condemned, as its enemies pretended to now see the real element of perniciousness. Yet before cocaine was ever dreamed of and during the long centuries in the history of Coca, not one case of poisoning from its use has ever been recorded. The accusation of "habit" had, however, long before been erroneously directed against the leaves. But of this, one who wrote scientifically and extensively on Peru after personal observation, sets forth his conclusions in the following positive way: "Coca is not merely innocuous, but even very conducive to health." [10] He even calculated the improbability of harm by estimating, if an Indian reached the age of one hundred and thirty years—which seems to be the only "habit" to which these people are addicted beside the "habit" for hard work—he would have consumed two thousand seven hundred pounds of leaves, an amount sufficient to have quite fully determined all pernicious possibilities.

The theory has been advanced that because cocaine is one of the chief alkaloids of Coca, it represents whatever sustaining quality the leaf can possibly have, and manufacturers base their choice of leaves

9. Rusby; 1888.

10. Von Tschudi; 1840.

upon the percentage of cocaine determined by assay. But this is not in unanimity with the selection of the native users of Coca, any more than would the quality of a choice tobacco leaf be governed by the amount of nicotine it contains. The fact is the Andean Indian selects Coca that is rich in the more volatile associate alkaloids and low in cocaine. It is what is known as the sweet in contra-distinction to the bitter leaf, which latter is made bitter by the large amount of cocaine it contains. On this very point an authority says:—"It only remains for me to point out that the relative amount of cocaine contained in native Coca leaves exerts no influence in determining the Indian's selection of his supply. As a matter of fact, the ordinary conditions to which the leaves are subject during the first two or three months after they are gathered have but little effect upon their original percentage of cocaine. The Indian, however, makes his selections from among such leaves with the greatest care, eagerly seeking the properly dried leaves from some favorite cocal, whose produce is always most readily bought out, and absolutely rejecting other leaves, notwithstanding that the percentages of cocaine may be almost identical." [11]

The absolute reliance of the Andean Indians upon Coca not only for sustenance, but as a general panacea for all ills, has naturally led them to feel a superstitious regard for the plant. This reverence has descended to them from the Incan period, during which the shrub was looked upon as "a living manifestation of divinity, and the places of its growth a sanctuary where all mortals should bend the knee." [12] However much the Incas reverenced Coca they did not worship it; it was considered the greatest of all natural productions, and as such was offered in their sacrifices. Their ceremonial offerings were made to their conception of deity—the sun, which they held to be the giver of all earthly blessings.

The ideas of moral depravity, and the fears of debasing habit following the use of Coca, have sprung from false premises and early misconceptions as to the true nature of the plant. As a matter of fact, neither "habit," as that is understood, nor poisoning has ever been recorded against Coca among the natives where it has been continued in use for centuries. Those early writers on Andean customs who allude to Coca chewing all speak positively against any evil result following its use. One physician, Dr. Henry H. Rusby, after being intimately associated among the natives for nearly a year, where he had witnessed the constant use of Coca, failed to find a single case of chronic cocaism, although this one subject chiefly occupied his atten-

11. Rusby; 1888.

12. Unanue; 1794.

tion, and he searched assiduously for information. Speaking of the amount used, he says: "what it does for the Indian at fifteen it does for him at sixty, and a greatly increasing dose is not resorted to. There is no reaction, nor have I seen any of the evil effects depicted by some writers and generally recorded in books." [13]

Dr. Rusby continues: "There probably does not exist a domestic remedy which is so largely used, and with such good results, as are coca-leaves. . . .

"Upon the Bolivian plateau we have a vast population of Aymara Indians, who subsist by agriculture, grazing, mining, and transporting goods across the mountains. The special adverse conditions of their existence are exposure to cold and sudden changes, a greatly rarefied atmosphere, excessive and long-continued exertions, and a very limited food supply. The Indian declares that he would be unable to meet these conditions successfully without the aid of coca, and I believe that the historical evidences are sufficient to support the assertions. The Aymara's means for battling with the physical world have been greatly straitened by his persecutors. The world's history furnishes no parallel of cruel oppression. Whatever scanty possessions he has wrung from the avaricious grasp of that desert region have been stripped from him by his conquerors. To this day we see there the paradox of a people who constitute at the same time the laboring class and the tax-paying community. I cannot wonder that some of my statements concerning the life of these people have been looked upon as exaggerated, but I can only reiterate them in the simplest manner. As the traveller, muffled in furs and woollens, rides across the wintry waste, his Indian boy trots along at his side, frequently through banks of snow, bare to the knees, or, at the most, protected by a pair of simple sandals; and, while the former is sleeping beneath a burden of blankets in a stone hut, the latter is shivering outside, with only a single thin and ragged blanket to protect him from the piercing winds which sweep across a plateau fourteen thousand feet above the level of the sea.

"The hired shepherds, whose wages are next to nothing, know no habitation, go barefoot, and sleep almost wholly unprotected. Fire is out of the question, as the fuel of those summits is sufficient for only the most necessary cooking purposes. The standard food of these people is quinoa, the seed of *Chenopodium quinoa* L., having somewhat the appearance of very finely-broken sago, and, when cooked, the consistency of oatmeal, with the flavor of spinach. When travelling so as to be unable to cook, he subsists on raw or parched maize. Even of

13. "The Therapeutic Gazette," 1888.

these simple elements he has not quite enough, and he is almost always hungry. On their frequently-recurring journeys as couriers, when little food can be carried, they often go for days almost without eating and subject to the most exhausting labor that is conceivable. The regular allowance on these rapid journeys is said to be not more than two pounds of parched corn for one hundred Spanish leagues. Under such circumstances the struggle for existence would seem severe enough even if life were inactive. But these poor creatures are obliged to carry heavy loads for such distances as seem incredible. The standard load for a *cargador* over the worst of the Andean passes is sixty-five pounds. . . . These people have been described as 'weak, puny, and intellectually little above the beast.' So far as this applies it is a race peculiarity, and it is the more remarkable that such a people should perform daily tasks during long lives, which would quickly destroy our finest athletes. I believe that cases do exist where coca chewers become intemperate, carrying the habit to a point where it becomes ruinous, but it is certainly true that the cases are so rare as to be almost unknown, and the result is doubtless due to constitutional peculiarity or predisposing disease. Cases of extra need are customarily met with an extra supply of the leaves, and the desired effect is always promptly obtained, but on the cessation of the unusual demand the consumption at once falls back to the accustomed amount. In cases of excessive exertion and exposure the Indian uses coca without any limit except his own appetite, but in all such cases I have seen that, the period of strain successfully passed, he enters smoothly and quietly upon his period of rest, eating enormously, but digesting with perfect satisfaction. In carrying a patient through a serious illness and during convalescence the same recourse is had to coca, but generally in the form of decoction or other fluid extract. . . ."

The early objections by the Spanish against the use of Coca were rather as persecutions, intended to still further oppress this conquered race by taking from them what was looked upon as an idle and expensive luxury. But Coca-chewing could never be an expensive luxury in a country where it grows wild, and where it is given by those in charge of laborers as a regular portion of each man's daily supplies. The later cries against its perniciousness, as has been shown, were based wholly upon the action of cocaine following the widespread use of that alkaloid as a local anaesthetic. The reports in the medical press of injurious effects from the use of cocaine all date from the period when the entire medical world was active in the discussion of the merits of this great boon to minor surgery. It would seem that many then rushed into print without regard to method so long as something was said about the all-absorbing topic of the time, which might direct a

portion of attention to themselves. A new opportunity had arisen when old tales and early prejudices might be again reiterated concerning Coca. The lay press was not slow to take up the sensational side of the subject, and the "cocaine habit" soon became a well-determined condition in theory, and a fashionable complaint. I have personally investigated a number of such reported cases and in every instance have found either that it was a condition engrafted upon some previous "habit" in a nervous subject, or else that the report was absolutely false. There is no motive—as the lawyers would say—for the offense, there is no reason for the establishment of a habit such as exists in the case of alcohol or opium. The fact is there exists a certain class of subjects who are so weak in will power, that if they should repeat any one thing for a few consecutive times they would become habituated to that practice. But such cases are the exceptions, and have no especial bearing upon Coca. In the collective investigation among several thousand physicians,[14] this matter was particularly impressed as an important point of inquiry and the answers sustained the facts already explained, that a Coca habit has never existed.

That Coca has survived the attacks which have been periodically hurled against it during several hundred years, and that its use is not only continued, but its therapeutic application constantly increasing, must suggest to the thinking mind that it is possessed of remarkable value. It has continued with the Andeans not because they have formed a "habit" for it, not because it fills their minds with that ecstatic and dreamful bliss as habit drugs would do, but because experience has taught them that they can perform their work better by its use. There is a practical utility in it which, as will be seen when detailing some of the customs of these people, is so exact that they measure their distances by the amount of Coca that they chew instead of by the rod and chain, or chronometer. Their use of this plant is continued day after day during a long lifetime, yet the amount of Coca which sustains them in young adult life is not increased in their old age. Its force product is a constant factor, just as a given amount of water under proper conditions will make a known amount of steam. The fuel taken and the work performed is always the same, other conditions being equal.

Can it be presumed for a moment that if this general and persistent use of Coca is a depraved habit, sapping the best of moral qualities, even manhood, unfitting its users to perform their duties, that these people would be capable of the immense amount of physical work which they do? It is known to be a fact by those employing large forces

14. See detailed report of physicians in Appendix.

of workmen in the Peruvian mines, that the Indian would not and could not perform the tasks he is set to under the exposure he is subjected to without Coca. This is well shown by contrast when foreigners are compelled to work with them, and are unable to perform an equal amount of labor to theirs until they too have recourse to the use of Coca. Thus it must be seen that Coca is as worthy to-day as it was in the time of the Incas of being termed the "divine plant." It is Nature's best gift to man. It neither morally corrupts nor undermines manhood, or vitality, as is well shown in these Indians, who are long-lived and are held by those who know them best, to be conservative, respectful, virtuous, honest and trustworthy, addicted to hard work—and the use of Coca, that they may more thoroughly and successfully do that work.

That any plant or substance which has been continued in daily use by millions of people over a vast territory, for many hundreds of years, should have so long remained unrecognized by the world at large seems almost incredible. Yet the fact is undoubted, as has been shown, and Coca is even to-day unknown to a great majority of not only the masses, but of physicians. Since the date of the Conquest, the constant use of Coca leaves by the Indians has been frequently referred to by travellers, often superficially, yet commonly agreeing as to its sustaining qualities. But so wonderful have these accounts seemed that their simple relation has usually excited doubt rather than belief. They have been looked upon as "travellers' tales," relations due to an imagination, which possibly had been expanded by the conjoined influence of a rarefied atmosphere, and an exalted desire to enhance the wonders of travel. So from doubting qualities which were long looked upon as improbable or unexplainable, and from the inaccuracies recorded by those who affected scientific research on old leaves, it was but a simple step to relegate the very existence of the plant to the legendary.

It has been shown in outline how varied were the causes to account for this unbelief, and the consequent neglect which followed. Primarily to superficial observation on the part of early explorers in an unknown country, where consideration for mere existence was to the unacclimated often of the first importance. Added to this was the conservative reticence of the Indians, and their superstitious regard for this plant so intimately linked with their religious and political life. This alone was sufficient to prevent the ready acquirement by travellers of a detailed knowledge of the use of Coca, or even of native customs and the reason for them.

Here was sufficient possibility for hasty conclusions, aside from the forceful attacks of both Church and State against what they were pleased to regard as the continuance of a superstitious practice or vulgar habit, which possibly linked the desires of these people whom

they hoped to Christianize, with an idolatrous past. Then, too, there existed as now, a class of zealots seeing imaginative wrong in every custom, who would have every act discontinued simply because it is done, in dread of some direful consequence which may result. In furthering each of these negative influences, theories were often advanced at variance with existent facts, and so many conflicting tales and much confusion has resulted. Absurd stories have been published, and these again copied without apparent attempt at verification, the whole establishing a falsity from which there has grown a diversity of opinion wholly inconsistent with the exact requirements of science. Meanwhile the rapid progress of the world in exploration often engrossed attention to the exclusion of details. The demand of commercial interests, for broad facts and immediate results in the amassing of wealth, diverted attention from the tales of travellers or the disputes of scientists. But as a higher civilization demands the resources of the universe to maintain its conditions, the secret of Nature's gift to the Andean could not remain long hidden, and the means which afforded support for these simple people was recognized as of possible benefit to the rest of the plodding, toiling world. As Coca was shown to be a necessity to the Andean in his toilsome travels of exposure, its adaptability was suggested to other members of the human family elsewhere located who are comparatively as subject to privation and hardship as are these primitive people. Even in our great cities among modern resources the labor is exacting and exhaustive, and whether the work done be a strain of muscular exertion or a prolonged mental effort, the resultant wear and tear is similar, and the conditions are to be met by recourse to the most expedient means available.

Unfortunately the Spanish invasion of Peru so largely destroyed all native records that it has been difficult to readily retrace a continued history of the remarkable people of this early civilization, among whom our story of Coca must begin. But from the period of the Conquest, after it had been made known to the outer world Coca was frequently sung in poetry or recounted in the tales of travellers. It however continued, since the privilege was extended from its early users to their descendants, to almost exclusively be enjoyed by these people until less than half a century ago.

In properly determining the benefits of Coca it seems desirable to trace back its historical connections and its associations between past uses and present necessities, as well as to inquire into those surroundings which have prompted its use and called for its continuance. This must necessarily lead us through many interesting fields where the view may seem remote from our narrative, yet is essential to the full understanding of a story the first impulse for which was generated in the

horrors of the Conquest. Before entering on this more prosaic story, I wish to recall a writing of long ago that is fittingly associated with our History of Coca.

Dr. Abraham Cowley, of whom Dr. Johnson said: "In Cowley's mind botany turns into poetry"—in 1662 wove the qualities of Coca through a legendary tale so accurately and charmingly that these have scarcely been added to by the research of other scientists.

At a convention of the gods, which was presided over by Venus, to discuss various fruits, the merits of each was set forth by its god. The poem is taken up where Bacchus, in illustration of the virtues of the vine, has offered a cup of wine to a South American godling:

> He, unaccustomed to the acid juice,
> Storm'd, and with Blows had answer'd the Abuse,
> But fear'd t'engage the European Guest,
> Whose Strength and Courage had subdu'd the East;
> He therefore chooses a less dangerous Fray.
> And summons all his Country's Plants away;
> Forthwith in decent order they appear.
> And various Fruits on various Branches wear.
> Like Amazons they stand in painted Arms.
> Coca alone appear'd with little Charms,
> Yet led the Van, our scoffing Venus Scorn'd
> The shrub-like tree, and with no Fruit adorn'd
> The Indian Plants, said she, are like to speed
> In this dispute of the most fertile Breed,
> Who chose a Dwarf and Eunuch for their head;
> Our Gods laughed out aloud at what she said.
> Pachamama defends her darling Tree.
> And said the wanton Goddess was too free;
> You only know the fruitfulness of Lust.
> And therefore here your judgment is unjust.
> Your skill in other offsprings we may trust,
> With those Chaste tribes that no distinction know
> Of Sex, your Province nothing has to do.
> Of all the Plants that any Soil does bear,
> This Tree in Fruits the richest does appear,
> It bears the best, and bears them all the Year.
> Ev'n now with Fruits 'tis stor'd—why laugh you yet?
> Behold how thick with Leaves it is beset;
> Each Leaf is Fruit, and such substantial Fare,
> No Fruit beside to rival it will dare.
> Mov'd with his Country's coming Fate (whose Soil

Must for her Treasurers be exposed to spoil)
Our Varicocha first this Coca sent,
Endow'd with leaves of wond'rous Nourishment,
Whose Juice Succ'd in, and to the Stomach tak'n
Long Hunger and long Labour can sustain;
From which our faint and weary Bodies find
More Succor, more they cheer the drooping Mind,
Than can your Bacchus and your Ceres join'd
Three Leaves supply for six days' march afford;
The Quitoita with this Provision stor'd
Can pass the vast and cloudy Andes o'er,
The dreadful Andes plac'd 'twixt Winter's Store
Of Winds, Rains, Snow, and that more humble Earth,
That gives the small, but valiant, Coca birth;
This Champion that makes war-like Venus Mirth.
Nor Coca only useful art at Home,
A famous Merchandize thou art become;
A thousand Paci and Vicugni groan
Yearly beneath thy Loads, and for thy sake alone
The spacious World's to us by Commerce Known.
Thus spake the Goddess (on her painted Skin
Were figures wrought) and next called Hovia in,
That for it's stony Fruit may be despis'd,
But for its Virtue next to Coca priz'd,
Her shade by wond'rous Influence can compose
And lock the Senses in such sweet Repose
That oft the Natives of a distant Soil
Long journeys take of voluntary Toil,
Only to sleep beneath her branches' shade;
Where in transporting Dreams entranc'd they lye
And quite forget the Spaniards' Tyranny.

—Book of Plants.

THE STORY OF THE INCANS

In tracing the history of Coca from its earliest associations, we are led into that wonderland of its nativity where its discovery and even first application is lost amidst the traditions which surround the empire overthrown by Pizarro. The dominant people of Peru at the time of the Conquest comprised a race highly advanced in civilization known as Incas, a mighty empire developed from a foundation laid by the semi-legendary Manco Ccapac [15] and his sister-wife, Mama Ocllo.

The most often related legend of the Incan origin describes a pair of white people—Manco Ccapac and Mama Ocllo—as mysteriously appearing on the shore of Lake Titicaca, and being possessed of a golden wand which was to act as a sort of divining rod to determine the location of the seat of the new empire wherever this rod should sink into the earth. Travelling north through the Andean garden of Eden, it was not until they reached the site of Cuzco that this golden wedge plunged into the earth and disappeared forever, and here was built the palace of the first Inca. One of the principal weapons of the Incan warriors was the *huaraca* or sling, and the shaping of the hills was often considered in their traditions as due to the clever hurling of monster stones by some legendary god, and so it was that *Huanacaure,* a brother of Manco Ccapac, had split the hills by some mighty throw. These stories are not wholly of Incan origin, but have rather become so through adoption in the course of centuries, for it was the habit of the Incas to blend the religion of conquered peoples with that of their own, while their traditions were continued and so ultimately looked upon as Incan.

Pachacamac, the founder of the world, was the name of an early Peruvian deity, otherwise known as *Uiracocha,* which latter has been corrupted to *Viracocha,*[16] a term of varied meaning at present applied by the Indians of some provinces to all white men, while the first title it is known was adopted after the conquering of the early people about the site of the present city of Lima, where the worship of Con

15. The double *c* in Quichua is pronounced like *k*.

16. *Viracocha* may be translated—"Foam of the sea," though Garcilasso less poetically says it is "Sea of grease."

and Pachacama prevailed.[17] One local legend represented these two as father and son, or brothers, children of the sun. They were without flesh or blood, impalpable, invisible and remarkably swift in flight. *Uiracocha* was the culture hero of the *Aymaras* or *Collas*, who are also referred to as a portion of the *Piuras*, an early Incan tribe of the Titicaca region. In their creed he was not only the creator but possessor of all things; though offerings of lands and herds were given to other gods, none were given to him—"For," said one of the Incas: "Shall the Lord and master of the whole world need these things from us?" He it was presumably—Who constructed the wondrous cities whose ruins are to be found about Titicaca. He also made the sun and moon and after placing them in the sky peopled the earth. Tradition has associated these legendary tales with real beings, of whom Manco Ccapac, the first Inca—who is supposed to have been a veritable personage—has been made the hero. However originating, it is agreed that this first sovereign founded his government, about the year 1021, at Cuzco, where, upon a hill so steep as to be practically unassailable, was established the first fortress of the Empire. But long before the time of this Incan hero this place had been the stronghold of some other race, of the origin or nature of which there is not even tradition.

In extending their dominions the Incans made no mere savage war, but their purpose was to teach the wild tribes about them, to instruct them in their religion and to elevate them to their plane.[18] Filled with this noble purpose no depredations were permitted among the conquered and no waste of life or property was tolerated. "For," said one of the Incas, "we must spare our enemies or it will be our loss, since they and all that belongs to them must soon be ours." One of the first things that was done after acquiring any new territory was to send a certain number of the newly conquered people into some other section of the country and these were replaced by a like number from the Incans, who were known as *mitimaes*. By this intermingling the customs of each were acquired by the other, so the transition became the easier.

In those districts east of the Andes where Coca could be cultivated, these new people were taught to raise the plant and paid their tributes in Coca to the government. Temples for worship were erected and the language of the Incas was taught, while the idols of the gods of the savages were carried to Cuzco and there set up in the Temple of the Sun. The chiefs of the conquered tribes were received in accordance

17. *Con*—thunder, *Ppacha*—source, *Cama*—all, the source of all things.

18. Modern authorities might be more cynical about the Incans' lofty motives for expanding their empire.—Eds.

with their rank and created Incan nobles, with rights little less than those of royal birth. So each new addition to the Empire was united with respect for the higher order of things because of this tribal interest in the seat of government, which was now looked upon as mutual. How far different from all this was the treatment of these noble people by those who claimed a higher civilization!

It is very probable that the Incan customs and many of their religious rites were fashioned upon the traditions of the people who preceded them as well as added to from time to time by the acquisition of newly conquered tribes. This has occasioned much historical confusion, but the fact is shown by the continuance of many Incan ceremonies which the Spanish found it impossible to wholly eradicate, and so cleverly united with their own. So that to-day, in the religious performances among the Peruvian Indians, there is frequently displayed a curious commingling of ancient ceremonies, with representations of native gods combined with the sacred images and observances of the Catholic church, which is the state religion of Peru.

As the Inca was the ruler of the four quarters of the earth, so the kingdom was divided into four parts, termed *Ttahuan-tin-suyu*—or the four provinces. These were *Anti-suyu*—east, *Cunti-suyu*—west, *Chincha-suyu*—north, and *Colla-suyu*—south, the people of each of these localities being distinguished by a peculiar dress, and when they were assembled in the capital city they took up their stations nearest to that part of the country to which they belonged. All the people were divided into *ayllus* or tribes, the unit of which was ten—the *Chunca,* similar to the division of government in ancient Rome. Ten families being under the command of a *Chunca camayoc.* The working members of each clan were assigned to definite occupations; the boys from sixteen to twenty were set apart for light work and were known as *Cuca-pallac* or Coca pickers. Above these were the *Yma-huayna* or sturdy youths, from twenty to twenty-five. Then the *Puric,* who were able-bodied men and heads of families, capable of the most trying work, finally the *Chanpi-ruccu* or elderly men, who were unfitted for labor. Ten *Chuncas* formed a *Pachaca,* ten of which were classed as a *Huaranca,* again formed into ten, making a *Hunu* of 10,000 men, each division being under an appropriate officer. The army was formed by groups of ten after a similar manner to that in which the people were divided into clans. Thus there were ten men, ten companies, and so on, extending up to a corps of five thousand, under the chief captain or *Hatun-apu,*[19] while under him was the *Hatun-apup-rantin,* and a half of this number obeyed an *Apu* or captain with his *Apup-rantins*

19. *Hatun*—great, *apu*—captain.

or lieutenants, while the whole army was commanded by an *Apusquipay.*

The Inca was always considered divine and as a direct descendant from the sun was regarded immeasurably beyond and superior to any others of the race. He was the source from which everything emanated, not only framing the laws, but enforcing their fulfillment. In all the ceremonies in which the sovereign participated he was surrounded with an imposing pomp, and his palaces were examples of rare magnificence. His court at all times numbered many thousand persons, including nobles of direct descent, the *curacas* or nobility of the conquered tribes, officers of the household, governors, astrologers, *amautas*—or philosophers, poets and servants.

The dress of the monarch was unique; he wore a tunic-like poncho, the *Ccapac-ongo*—of spotless white, bordered with precious stones. This robe was short to expose golden knee coverings. The *suntur-paucar* was a headdress of gold ornamented on each side with spurs and surmounted by two white feathers of the royal bird—*coraquenque*,[20] on its front was the figure of *Inti-churi*—the sun god. About the head was a soft turban termed *llauta*—of red, from which was suspended a scarlet fringe of wool—the *borla*—the especial badge of sovereignty, while two bandelettes dropping to the shoulders formed a frame around the face somewhat suggestive of an Egyptian headdress. On state occasions a collar of emeralds was worn, and the hair was decorated with golden ornaments. On the monarch's feet were golden *usutas*—or sandals, and a fringe of red feathers was about the ankles. From the left shoulder hung a striped mantle, while a band worn saltierwise suspended a little bag known as *chuspa*—woven in delicate patterns from the finest wool of the *vicuña*—in which the Coca leaves were carried. This bag was as important a portion of the vestments of the sovereign as was the royal headdress, or the *camppi*—sceptre, held in his right hand. The people of the Inca were distinguished by the varying colors of their headdress—that of the immediate family was yellow, while for the royal descendants it was black, and even the attendants wore some distinctive dress, the court livery being blue, while that for the guards, the army and for the nobles was all different and at once showed not only the rank, but lineage.

Usage allowed this mighty king one wife, termed *coya,* though he was privileged to maintain a royal harem formed of as many concubines as might be thought fitting to his pleasure. Usually these were

20. The "Coraquenque" or "Alcamari" is a vulture-like bird of the higher Andes. It has a scarlet head, black body with long white wing feathers. The Incas believed there was but a single pair of these birds, created to supply the two white feathers in the crown of each monarch.

maidens chosen from the Virgins of the Sun. Once they had basked in the royal sunshine, an element of grandeur clung to them ever after, even though they might be cast aside. During the most brilliant epoch of the monarchy these concubines are said to have numbered fully seven hundred, each one having many servants. As may be inferred, the progeny of the sovereign was numerous, some of the Incas having left more than three hundred descendants.[21]

The daughters of the sovereign were termed *ñustas* when maidens, and *pallas* when married. While some few may have been privileged to grace the royal court, the majority were sent in childhood as Virgins to be educated in the Temple of the Sun under the supervision of a *mamacona* or mother superior. Here, tenderly guarded in chaste seclusion, they were taught to tend the sacred fires until chosen to become concubines—*huayru-aclla* for the sovereign. Thus the royal blood was continued through an exclusive descent by these incestuous unions similar to those practiced in the East.

The male children of the wife were the royal successors and formed the heads of tribes or *ayllus*. They were carefully educated in their youth by the *amautas* or learned men until such time as they were fitted for the *huaracu*, a ceremony similar to the Order of Knighthood of the Middle Ages—possibly more nearly resembling the initiation into the Ancient Mysteries. The successful candidates were accorded privileges of manhood and thereafter permitted to wear the *chuspa* and use the royal Coca, emblematic of vigor and endurance. The male descendants of the concubines, while regarded as princes, could not take succession, but they were considered as of noble lineage and entrusted with important offices.

The physical appearance of the Incan race may be surmised from the early paintings which are still preserved at Lima, and a comparison of these with the Peruvian Indians of to-day. In stature they were from five feet six to five feet ten inches, with well knit frames, the muscular system not pronouncedly developed, the limbs rounded with underlying fatty tissue, of slender form, yet capable of prolonged endurance; the head large and square, the complexion a fresh olive, nose aquiline, eyes slightly oblique, the hair straight and black. Their features were almost of a feminine cast and strongly suggestive of the Mongolian type.

The government of the Incan Empire was so cleverly planned that the sovereign had at all times the closest supervision over the minutest detail concerning his subjects. This was maintained by a sub-division

21. Garcilasso; 1609.

of officials, who made monthly reports to their chief. Inspections were frequent and punishment, from which there was no appeal for any offense, was almost immediate and in any case within five days, while the officer who failed to enforce the appropriate punishment was himself liable to the same penalty as the guilty. The form of punishment was usually death, though not inflicted in a way of torture. The code of civil laws was very concise, embracing the following commandments:

Ama quellanquichu—Avoid idleness.

Ama llullanquichu—Avoid lying.

Ama suacunquichu—Avoid stealing.

Ama huachocchucanqui—Avoid adultery.

Ama pictapas huanuchinquichu—Avoid murder.

The breaking of any law was considered not only as an offense against the community, but a sacrilege against the divinity of the sovereign.

There were special officers to oversee every industry as well as to govern every means for the public good. The various departments of agriculture—especially the cultivation of the Coca crops, were carefully supervised, while the roads, the bridges and the waterways each received direct attention. Even hospitality was governed, while rules were laid down to promote social intercourse, to insure fulfillment of which the doors of the houses could not be secured, so that everything might be free to inspection by the *Llactacamayoc*—or superintendent of towns, at any time. These several offices were usually filled by descendants of the nobility—the *aqui* or sons of royal princes, who were not only appointed governors of provinces, but led the *mitimaes* or colonists.

Agriculture was carried to a high state of perfection and the Inca as a Patron of husbandry set a worthy example at the beginning of each season by breaking the ground with a golden plough on the terraces back of Cuzco. Every available piece of earth was cultivated. Upon the barren mountains, where there was not sufficient soil, terraces—or *andenerias,* as they were termed, were built. These, of varying height and breadth according to the inclination of the mountain, were walled with rock and filled with suitable earth. In such places the early method of Coca cultivation was largely followed, some of these steps being only wide enough to maintain a single row of plants. Another method of gaining an area of suitable ground was by digging huge pits, known as *hoyas,* fifteen or twenty feet deep and often covering in area an acre of ground. These were filled with appropriate manure and soil for the local cultivation of just such form

of vegetation as was desired. Some of these pits were so substantially built as to remain as examples of surprise to the modern traveller.[22]

The Incas carried their system of irrigation to the greatest perfection through a series of canals known as *acequias.* These were constructed on so substantial an order that many of them are still in existence—some in a state of decay, while others are now in use. They were built of slabs of sandstone cleverly laid together, as were all the Incan buildings, without the use of cement. They were capable of carrying a large volume of water, which was usually brought from one of the elevated lakes on the mountains, with such additions as might be made to it from smaller streams in its course. These canals were carried through all obstacles—through rocks, around mountains, across rivers and marshes—and were of very great length. One passing through the district of Condesuyu was nearly five hundred miles long.[23] *Lacarrillca*—the god of irrigation—was supposedly responsible for this great perfection of watering which the practical industry of these people carried in every direction to distribute fertility and verdure, where a higher civilization has permitted a lapse into desolate barrenness.

It was a peremptory Incan law that all must labor at something, and each subject was assigned to a certain occupation, so the various industries were followed by workers who had been trained through long experience. It is astonishing to consider how these industries were continued without what we consider appropriate appliances, for steel was unknown to the early Peruvians, and although iron was plenty about them it was not used. Their weapons and tools were made of stone or a peculiar alloy of copper—known as *champi,* made from a mixture of copper and tin, after the manner of some of the Eastern nations, the secret of which has never been learned. With this the Incans made picks, crowbars and hammers, which enabled them to mine the precious ores in the mountains, and from the metals obtained they represented the various natural objects that were known to them. Gold was fashioned, molded and cut in every conceivable shape. Plates of this metal were used to line the Temple of the Sun, while statues of life size and of massive weight were neatly wrought from it. The same metal was drawn into delicate threads, which were interwoven in the royal fabrics, while small plates and variously shaped golden figures were worn upon the borders of the robes. Animals, fruits, flowers and plants were all fashioned in gold, and thin coverings of this were so cunningly put about objects as to make them ap-

22. Stevenson; 1825.

23. Prescott; 1848.

pear to be of solid gold.[24] A similar merit in technical design is shown in the relics of Incan pottery, as also in the textile fabrics which these people wove from the finest wools. These each display an artistic cleverness in imitation.

The Incan architecture, while not of a very high order, had an effectual grandeur—which has been favorably compared to that of the Egyptians and early Greeks. The buildings, which were usually but one story, were commonly built of granite or porphyry, or an adobe of great hardness, the composition of which is not known. A peculiarity of the Incan buildings is the battered walls—sloping from the base upward, and straight cut doorways of a similar slant, with flat roofs or domes of thatch in some instances of great thickness. The structures often covered considerable space and were built of many courts surrounding a central opening, after a style that is pronouncedly Egyptian. The stones were laid together without cement and where timbers were used these were bound together with thongs made from the fibre of the American aloe—or maguey.

Those of the masses who were not fitted for more laborious work often became herbalists, and it is probable the Incans had an intimate knowledge of the plants about them and their application in an empirical way. The women and children were commonly employed in the Coca harvests and to this day the gathering of these leaves is best done by this class of labor. Spinning, it would seem, was hardly carried on as a separate employment, but was followed, as it is still continued by their descendants, by those nimble fingers not otherwise employed. The women were required to weave a certain amount of cloth as a portion of their contribution to the general stores of the country. All products of labor were divided between the high priest, the government, the warriors—who by their military duties were prevented from industrial pursuits—and the Inca. After these tributes had been paid, the subject was free to use his time to his individual wants. If the products of any province fell short the deficiency was supplied from some other section. Those provinces that cultivated the soil were obliged to contribute to those where only mining could be pursued, and so the earnings of the entire country were equalized by a legally arranged distribution, for money was not in use and indeed was unnecessary. So automatic had this system of equalization become at the time of the Conquest, that the Spaniards saw Incan officers noting the damages that had been done in any one province and endeavoring

24. It has been suggested that gold was molded as an amalgam with mercury, which was after drawn off by heat. Yet this action of mercury is said not to have been known to the Incas.

to make these good by assessments upon districts that had not been interfered with.

The subjects, as we have seen, were divided into small clans. It was the law that each year every male member should be allotted a certain measure of land—*fanega*—equal to an area which could be sown with one hundred pounds of maize, the cultivation of which would be sufficient not only to support him, but to provide the necessary tribute demanded by the government. No subject was permitted to leave the tribe—*ayllu*—nor the portion of land to which he was assigned. Thus there could be no roaming about in search of wealth or adventure, and no discontent, for, as has been shown, all temporal necessities, and presumably all spiritual requirements as well, were provided for by the sovereign.[25] At a proper age—usually at twenty-four in the men and at eighteen in the women—marriage became compulsory, but a choice was permitted and the consent of the family was deemed necessary. Upon a certain day of each year the couples were joined in the public square by a representative of the Inca, and a suitable home was provided for them, an extra portion of land being at the same time allotted, while a similar grant was made at the birth of each child.

The Inca was not only the head of the temporal power, but because of his divine origin the representative of the spiritual light as well. All of the religious feasts were appointed by him, and once each year he entered the most sacred place in the Temple of the Sun stripped of his magnificence as a token of humility, to give thanks and crave for continued protection. Special sacrifices of Coca were made at these times and, in fact, it was considered essential that supplicants should only approach the altars with Coca in their mouths, and the idea was prevalent among the Peruvians that any important affair attempted without an accompanying offer of Coca could not prosper.

At stated intervals the sovereign travelled through his dominions, being carried in state over those famous roads which the Incas had constructed. The people along the way everywhere vying with each other to do homage to their sovereign, cleaned the road from every loose stick or stone and strewed flowers before the royal litter, while the places where halts were made were ever after considered as sacred. The royal *hamaca,* or sedan, was a sort of open throne emblazoned with gold and of inestimable value. It was richly decorated with plumes of tropical birds and brilliantly studded with jewels,[26] and borne on the shoulders of subjects chosen as a mark of honor, though the post was not coveted, for a fall was punished with death. Accom-

25. On this point also modern authorities would tend to be more cynical.—Eds.
26. Prescott; 1848.

panying the cortege was an immense retinue of warriors and nobles.

There were two chief roadways, one built along the coast and another at an elevation on the mountains, both of which extended through the length of the domain and are estimated to have been nearly two thousand miles long. The coast road was some fifteen to twenty feet in width, carefully paved, and having a wall running at either side to prevent the accumulation of drifting sand. Wooden posts were erected to mark out the line of travel when crossing the desert, while in the upper road stone pillars after the manner of mile stones were set at intervals. The mountain road was the more important, and was conducted over paths often buried in snow, at other places cut through miles of solid rock, or crossing ravines and streams over frail-looking suspension bridges made of maguey fibre woven into cables. The whole construction has been pronounced worthy the most courageous engineer of modern times. Portions of these roads which still remain show a pavement of cobble stones, though some writers describe a flagging of freestone covered with an artificial cement which was harder than stone.[27] In places where the streams have washed away the substratum of earth arches of such a material are often found.[28]

Along these roadways, *Corpa-huasi,* or store houses, were erected at intervals, where Coca, quinoa, various fabrics and supplies were stored for the troops, while at shorter intervals there were post houses with relays of couriers or runners known as *chasquis,* who were at all times ready to convey messages with marvelous rapidity. These messengers, unlike some modern examples, were selected for their swiftness, and as the distance each courier ran was small, there was ample time to rest. The runners were sustained and stimulated in these efforts by the chewing of Coca leaves, each messenger being allowed a portion suited to the exertion which he might be required to perform. A dispatch having been given to a *chasqui* at one end of the line, he ran to the next post house, and when within hearing commenced to shout the nature of his message, which was at once taken up by another runner, and so sent along the line. By this method it is said messages were conveyed at the rate of one hundred and fifty miles a day.[29] Montesinos relates that Huayna Ccapac ate fresh fish at Cuzco which had been caught in the sea the day before, although some three hundred miles away.

It is remarkable that we have so correct an account of the customs

27. Velasco; *Historie de Quito.*

28. Humboldt said these roads were the most useful and stupendous works ever executed by man.

29. Prescott; 1848.

of the Incas when it is considered they had no written language nor even a system of hieroglyphics or picture writing, as did some of the peoples contemporary with them. Their doings were handed down orally by a system of court orators known as *yaravecs,* who related at the councils before the sovereign the history of the royal race in detail. In these relations, however, it was not considered good form to speak of the achievements of the existing monarch. This ceremony was carried out on all state occasions, and intimately rehearsed not only the valorous deeds and laudatory undertakings of the preceding Incas, but also of the nobles and chiefs as well as various matters of interest to the people. In this manner all that had occurred throughout the empire was passed in review at frequent intervals, and so continued from one generation to another. They were assisted in these marvelous examples of memorizing by a knotted, fringe-like instrument, known as a *quipu.*[30] This contrivance consisted of a large cord, varying in length from two to six feet, usually woven from llama wool, from which hung cords variously knotted and of different colors. In some cases the colors were emblematic of special objects, as white—silver, yellow—gold, or green—Coca. Again they might denote abstract ideas, as white—peace, red—war, or green—the harvest, while a combination of knots usually referred to amounts. These instruments were in charge of the *quipucamayus,* or keepers of the *quipus.* By this aid they were at all times in readiness to supply the government with special information in detail.

Calculations were made from the *quipu* with the greatest rapidity, more rapidly, says Garcilasso, than could an expert mathematician cast up an account in figures. After the Conquest the Spaniards were astonished at these phenomenal exhibitions of memory, which often tended to embarrass them through the verbal exactitude in which transactions were deliberately reiterated. These orators were permitted to have recourse to Coca to strengthen, if not stimulate, their capacity for recollecting, while the *quipu* was referred to as a sort of mnemotechny, or artificial memory. This manner of recalling a thought is analogous to the *wampum* of the Indians of the North Atlantic coast, which was composed of bits of wood strung together and worn as a belt; to the *phylacteries* of the early Hebrews, by which they preserved before their minds the words of law, and to the *rosary* of the Catholics instituted by St. Dominic as a means of meditation. Each keeper of a *quipu* was not expected to recount all the doings of the empire, but there were specialists who recorded only certain matters. One had charge of the revenues of the state, another

30. Quipu—a knot.

recorded the vital statistics, another recorded the condition and yield of the crops, and these several instruments were sent to the capital, where they constituted the national archives. When the royal orator related his account of the doings of any department of the empire, he was assisted by a reference to these knotted records. The recital commenced with an address to the sovereign; thus one referring to Coca is thus related:

"Oh, mighty lord, son of the Sun and of the Incas, thy fathers, thou who knoweth of the bounties which have been granted thy people, let me recall the blessings of the divine Coca which thy privileged subjects are permitted to enjoy through thy progenitors, the sun, the moon, the earth, and the boundless hills," following which prelude were recounted the uses and benefits of their sacred plant as might be appropriate to the occasion.

These oft-repeated accounts were taught by the *amautas* to their pupils, and by this method history in even minute details was handed down from one generation to another with remarkable exactitude. These knot records were largely destroyed by the Spanish after the Conquest through a belief that they were emblems of idolatry, so that much valuable information has been lost to us, presuming that any interpretation might now be made from such means.[31]

Cuzco, the royal city, was divided into four parts, like the Empire, and with the same titles. The four great divisions of the country were each ruled over by a Governor, aided by his councils from the different departments. The chiefs usually resided in the capital, which was not only the royal city, but the holy city, venerated as the abode of the Incan sovereign—son of the sun, but also the lodging place for the several deities of the conquered nations. Here was the Mecca to which each subject of importance at some period of his life strove to have his duty lead him, for none could travel without the royal command.

Sun worship prevailed in ancient times among many of the early races. The sun was the most wonderful object the people beheld. Its presence was the giver of light, of heat and of life, while when it had set there was darkness, and a stillness suggestive of the end of all things. Thus it seems but natural that the sun should have been re-

31. It is said that before the accession of the Emperor Fo-Fli, 3,300 years B.C., the Chinese were not acquainted with writing, and used the knotted records or cords with sliding knots after the manner of the instrument known as an abacus used for teaching children numbers. These were known as *Ho-tu* and *Lo-shu*. Confucius relates that the men of antiquity used knotted cords to convey their orders, while those who succeeded them substituted signs or figures for these cords, Jaffray; *Nature*, Vol. II, p. 405; 1876. The people of Western Africa are also said to have used similar instruments. *Astley's Voyages.*

garded as divine, together with those objects that were considered its representative, as the moon, the stars, and fire. The followers of that ancient philosopher, Zoroaster, considered fire the supreme emblem of divine intelligence. In ancient Baalbek the sun was worshiped with great ceremony. Turning toward the sun was a practice among certain Hebrews. The Parsee looks toward the sun in prayer, and the custom of facing the East has been continued in the modern church. So from a regard of the sun as the creator of all things, it was but a single step to look upon the several representatives of that element as symbols of life and generation from which lesser emblems were chosen. Thus the egg as the germ of living matter, the cock which by its early morning crow seems to call forth the sun, the serpent because of casting its skin and so regaining fresh youth annually, the *phallus* and even our Easter flowers, have each been looked upon as sacred emblems suggesting creation, if not directly worshiped. It was in this same spirit that Coca was considered as the divine plant, because it was the means of force and strength as well as a stimulant to reproduction; and the Incan Venus was represented as holding a spray of Coca as typifying the power and fruitfulness of love.

The Incas did not consider the sun as the Supreme Being, but only His representative. Thus at a grand religious council, held about the year 1440, to consecrate the newly built Temple of the Sun, Inca Yupanqui spoke to his subjects as follows: "Many say that the sun is the maker of all things, but he who makes should abide by what he has made. Now many things happen when the sun is absent, therefore he cannot be the universal creator; and that he is alive at all is doubtful, for his trips do not tire him. Were he a living thing he would grow weary, like ourselves; were he free he would visit other parts of the heavens. He is like a tethered beast, who makes a daily round under the eyes of a master; he is like an arrow which must go whither it is sent, not whither it wishes. I tell you that he, our father and master the sun, must have a lord and master more powerful than himself, who constrains him to his daily circuit without pause or rest." [32]

Thus it will be seen that the sun, moon and lesser lights were worshiped merely as symbols, while to enforce a belief that the race descended from their sacred emblem emphasized the divine origin of the Inca, whose authority was unquestioned, for if we except the incident of Ollantay, no case of rebellion was known through the entire rule of these people up to the period when the Empire was

32. Balboa; 1580.

divided between the brothers Huascar and Atahualpa, just prior to the Conquest.

Representations of the serpent are frequently found among Peruvian relics, for serpent worship was a conspicuous element of the Incan ritual and religion. There was an annual serpent dance in which it is asserted that the dancers held an immense golden cable, each link of which was fashioned as a serpent with its tail in its mouth, and the dancers seem to have followed a serpentine course through the streets of Cuzco. A similar dance among the Pueblo Indians has been described by the late Major Bourke, Dr. J. W. Fewkes and others. Mr. Stansbury Hagar has published an account of another serpent dance amongst the far-distant Micmacs of Nova Scotia. In Peruvian astrology the serpent rules the zodiacal sign of the Scorpion, in which position it symbolizes wisdom and, singularly enough, the diverse concepts death and immortal life; death because of its sting, immortal life because of its annual resurrection from its discarded skin, thus displaying a wisdom in what the Peruvians considered the acme of knowledge—the evidence of life beyond the grave. As the symbol of life and the active life-giving power the serpent also attains phallic associations. Besides these relations it became from a variety of causes associated with time, the year and the zodiac.[33] The serpent appears on the ancient monuments at Tiahuanaco, and in Peruvian designs wrought in gold, silver, pottery, cloth and stone and throughout many architectural ornaments. So intimately associated was the snake with the astrology and with the rites of the Incans that it was included in the escutcheon granted them in 1544 by Charles the Fifth.

Magnificent temples for the worship of the sun were erected all through the land of the Incas, the chief temple at Cuzco being on a scale of particular grandeur. It was situated in the lower part of the royal city, on the high bank of the Huatenay, probably eighty feet above the bed of that stream. It was built in the same massive manner as were all the Incan structures and ornamented on a scale of unequaled magnificence, being lined with plates of gold, while all around the outside of the building ran a coronal of this metal about three feet in depth. At one end of the temple was an immense image in gold of the sun. Before this, in two parallel lines, were the embalmed—or preserved bodies of the Incas. These, arranged in the order of their succession, sat in their royal robes upon golden thrones raised upon pedestals of gold, the mummy [34] of Huayna Ccapac, who was regarded

33. Hagar; *person. com.*, May, 1899.

34. The word mummy is derived from the Arabic *Mûmiâ*—bitumen.

as the greatest of the line, being honored by a special position in the very front of the golden emblem.

The buildings which the Incans used for ceremonial rites were made as grand and imposing as a free use of the precious metals could make them. In the gardens surrounding the temple at Cuzco, where—as one of the Spanish chroniclers stated, the trees and even the insects were of precious metal—there were cleverly modeled representations of animals, flowers and examples of the Coca plant, all exquisitely shaped in pure gold. Cuzco was in fact the repository of the wealth of the Empire, being literally, as it was termed, *Coracancha,* the town of gold, for no gold or silver that was ever brought to the capital was permitted to leave it during the integrity of the Empire. Near to the Temple of the Sun were other structures dedicated to the moon, Venus, thunder, lightning and the rainbow, all of which were elaborately decorated with gold. Close to these was the convent—*acllahuasi,* of the Virgins of the Sun; that at Cuzco being an imposing structure some eight hundred feet long and two hundred and fifty feet broad.

In the Incan religion no women were assigned to the *huaca* of their supreme god, for as he created them, they all belonged to him, and this same idea was manifest in the royal selection. A lapse from virtue among these maidens was a crime so abominable that it was punished with death, the offender being burned or buried alive, as was also the penalty imposed among the Greeks. The male offender was not only put to death, but his entire family was destroyed as well as his property and effects, and his habitation was left a desert, that there might remain neither tract, trace nor remembrance of him. The Temple of the Virgins at Cuzco during the height of the monarchy is said to have contained about fifteen hundred maidens who had been selected for their physical charms.

The reigning Inca, as son of the sun, was at once sovereign and pontiff, exercising absolute authority over both temporal and spiritual matters, but the religious rites were performed by his representatives through a system of priesthood. The *Villac-umu,* or chief high priest, held office for life; he was appointed by the Inca, and was considered next in authority to him. His title, which implies "the head which gives counsel," explains his position. Priests of lower degree were appointed by him, and to preserve the faith these were usually chosen from among the nobles.

Each province had its *Villac*—or chief priest, while beneath these were others who offered sacrifices in the temples, speakers to the oracle, together with soothsayers and diviners of all kinds, each being designated in accordance with the duties of his office. Thus the one who offered Coca leaves in the fire and foretold events from certain curlings

of its smoke or other signs at the time of its combustion was termed *virapiricue*. The dress of the priests was white, emblematical of their purity in celibacy and fasts which they were required to practice. No ceremony was ever considered complete until the *Villac* had thrown Coca leaves to the four cardinal points, and from this association in every religious rite Coca was ultimately regarded by the masses as divine.

It might be supposed that as the Incas regarded the sun as their father they would have made an especial study of the heavens and been expert in astronomy, though they were not as advanced in this science as were the early Mexicans. They had a knowledge of certain constellations; the bright star *Spica* in *Virgo* they referred to as Mama Coca.[35] They divided their year into twelve lunar months, each distinguished by an appropriate name and usually designated as well by some festival. The months were divided into weeks, but the number of days in each is not now known. To harmonize the lunar with their solar year, observations were made by means of certain upright stones similar to the stone circles of the Druids and like those found in parts of Northern Europe and Asia. The shadows from these stone pillars formed a scale for measuring the exact times of the solstices. The equinoxes were determined by an erect stone in shape like a truncate cone, projecting above a table of solid rock from which the whole was cut. This was termed *intihuatana*,[36] or place where the sun is tied up. A line was drawn across the level platform from east to west, and observations were taken as to when the shadow of the pillar became continuous on this line from sunrise to sunset. When the shadow was scarcely visible under the noontide rays it was said "the god sat with all his light upon the column."

Similar methods for determining the seasons certainly date from the most ancient times and were known to the early people of the East, who were even considered as capable of juggling with the sun's rays. Thus, when the prophet Isaiah offered to show King Hezekiah a sign that the Lord would heal him, he asked whether that sign should be that the sun's shadow should go forward ten degrees or go back ten degrees, "And Hezekiah answered, It is a light thing for the shadow to go down ten degrees; nay, but let the shadow turn backward ten degrees," which miracle, it is related the prophet showed.[37]

The period of the equinoxes was celebrated by important festivals, and similar festivals, differing in degree, formed an intimate part of

35. Hagar; *person. com.*, May, 1899.

36. *Inti*—sun, *huatana*—the place where or thing with which anything is tied up.—Squier; p. 524, 1877.

37. 2 *Kings;* xx, 10.

the ceremonial worship of each month. The full moon was an occasion for honoring the deities of water and the patrons of agriculture, while her various phases were consecutively honored as having some bearing upon the crops. As the sun was their father, so the moon was to the Peruvians their *Mama Quilla,* the goddess of love and the patronness of marriage and childbirth.

During the first month, *Yntip Raymi,* the festival of the winter solstice was celebrated, and especial attention was given to preparing the fields and arranging methods for their irrigation. Following this, during the month *Chahuarquiz,* the sovereign inaugurated the season of ploughing by turning up the soil on the royal terraces back of Cuzco with a golden plough, for, as has been shown, agriculture was taught as the favorite industry of this country, where many barren spots rendered fertile soil very precious. During *Yapa-quiz* maize was sown, from which time, until it had grown to a finger's height, the *tarpuntaes,* or special priests in charge of this harvest, fasted from drinking chicha and from chewing Coca leaves, while the songs of the people besought prosperity, to favor which, offerings of Coca, maize and sheep were made.

The festival of *Situ*—the spring equinox, was held in *Ccoya Raymi.* As much sickness commonly followed the rainy season, which was now about due, the prayers and ceremonies were designed to prevent such evil in the land. This festival was particularly imposing. The *huacas*—or sacred things, were brought to the temples, and the nobles and people assembled in the public squares for the celebration. At these times all deformed and diseased persons were forbidden to be present, for despite the extreme kindness of the Incas for the unfortunate, they superstitiously regarded sickness as a punishment for some fault, and they supposed that the presence of the ill at this time might prevent that good fortune which they craved. Even the dogs were driven from Cuzco, lest their howling might be offensive.

A curious ceremony was now performed by four hundred warriors, who were divided into groups representing the four provinces of the Empire and stationed East, West, North and South, facing the great square. After certain ceremonies in the Temple, the Inca, accompanied by his priests, came forth and exclaimed: "Oh, sickness, disasters, misfortunes and dangers, go forth from the land," when instantly the warriors ran with great speed toward the rivers Apurimac and Vilcamayo, shouting: "Go forth all evils!" Here they bathed, and the waters supposedly carried the evils away. At night bundles of straw were burned and thrown into the rivers, and so the evils of light and darkness were equally destroyed. These ceremonies were accompanied by fasting, except for the eating of a porridge termed *sancu*—a sort of

sacred pudding, which was also smeared over their faces and upon the lintels of the doors. Finally this was washed away, emblematical of their desire to be free from personal sickness or from disease entering their houses. It was at this festival particularly that the bodies of the Incas were brought out into the square from the Temple, where they were set up and attended by their people, who offered them the best of everything in the way of food and drink. In the evening these bodies were bathed in the baths which had belonged to them, and the following morning offerings of Coca and various foods were set before them, and the day was concluded in feasting. *Uma Raymi*—the month following this festival, was the season of brewing. During this month the ceremonies of knighting the youths took place, followed with much rejoicing. The following month, *Ayamarca*, was the period when they commemorated their dead, and offerings of Coca were made to the mummies under the supposition that wherever the soul might be it would be fed and sustained through this emblem of strength.

The ceremony of knighthood was one of the most imposing festivals during the Incan year. It was termed *Huaraca*—the sling, and was celebrated during the summer solstice upon the sacred hill Huanacauri, where a legend relates that a sun god had at one time been turned into stone. Here the ceremonies commenced by a prayer, offered for the perpetuation of manly vigor: "O Huanacauri! Our father, may the Creator, the Sun, and the thunder ever remain young, and never become old. May Thy son, the Inca, always retain his youth, and grant that he may prosper in all he undertakes. And to us, Thy sons and descendants, who now celebrate this festival, grant that we may ever be in the hands of the Creator, of the sun, of the thunder, and in Thy hands."

The young nobles were only initiated after they had arrived at a certain age and after they had passed through a preliminary rigorous ordeal. This was more suggestive perhaps of the severity of the initiation into the Ancient Mysteries than it was to the knighthood of the Middle Ages. The novitiates were put to very severe tests, which resulted literally in only the survival of the fittest. The first token given the applicants was a pair of breeches made from the fibre of the aloe. After this they were fitted for endurance by a severe flogging and were then given the staff, *yauri*, and *usuta*—or sandals. They then passed a night alone in the desert, and the following day continued the test of endurance by foot races at *Huaca Amahuarqui*, where tradition says there was a *Huaca* that ran like a lion. The competitors were stimulated by the encouragement of maidens along the course, who offered chicha and Coca and cried—"Come quickly, youths, for we are waiting." Those who survived the ordeal then met in an assault at arms,

and those who were accepted to become warriors had their ears bored by the Inca with a golden stylet. The orifice was kept open with cotton until large enough to admit the large cylindrical earrings, the tubular support of which was pushed through the opening in the lobe, and this method of wearing these ornaments caused the lobe to elongate and occasioned an appearance which led the Spaniards to call the Incas *Orejones*—big ears. After bathing in the sacred fountain called *callipuquio* the Knights were given a shirt of fine yellow wool, bordered with black embroidery and a mantle of white—*supayacolla.* This cloak, which reached to the knees, was fastened about the neck with a knot, from which hung a woolen cord and tassel of red. A turban or *llauta* of distinguishing color was worn upon the head, and each Knight was now invested with the *huaraca,* or sling, and the *chuspa,* filled with Coca leaves, emblematic of vigorous manhood which this would maintain. This entire ceremony occupied some eight days.

Throughout the year the ashes from the various burnt offerings that had been made in the temples were saved, and at a ceremony during the month *Camay,* following the summer solstice, these were thrown into the river at an hour before sunset, together with large quantities of personal effects, Coca, foods, garments, and, in fact, something from everything that had been used, presumably as an offering to the deity in the great unknown to which the river flowed. To assure the carrying of this sacrifice by the waters the rivers were previously dammed back so they might rush with greater force when released, and guards were stationed with torches to see that no part of the sacrifice was checked in passage. When all had been carried down the stream as far as the bridge of Ollantay-Tampu, two bags of Coca, termed *pilculuncu pancar uncu,* were thrown in from the bridge, and the people followed the sacrifice along the banks of the stream for two days.

At the autumn equinox was held the festival of the sacred fire, *mosoc nina,* which was never permitted to die out, and the year was completed with the rejoicings and festivities commemorative of a full harvest. Sacrifices of Coca were made in the Temple of the Sun daily, also on various hills in the valley of the Vilcamayo, the method of these offerings varying; at times the leaves were thrown to the four cardinal points, while at others they were burnt upon the altars, both ceremonies being accompanied by an appropriate prayer.

The Incans had a great reverence for their dead. Not only were the bodies of the sovereigns preserved, but it was customary for families to preserve the bodies of certain of their departed so that they might be seen. Food was set before these mummies on the occasion of all festivals, in the belief that wherever the soul might be it would return for this nourishment, while if appropriate food was withheld from the

dead it would occasion disease. These bodies were termed *mallquis* or *manaos,* and were believed to extend a protection over the family, an idea not far removed from modern spiritualism.

Offerings of food to the dead was a very ancient Eastern custom; thus it is written that the Israelites in the wilderness were accused of idolatry because they ate these sacrifices.[38] The North American Indians believe in the duality of the soul, one being liberated at death, the other remaining in the body, which must be provided for.[39] The Egyptians believed the tomb of their dead was inhabited by a double—*ka,* of the deceased, and so an ante-chamber was always built where relatives might leave their offerings for this substance. In the absence of more material fare the walls of the sepulchre were profusely decorated with a semblance of good cheer.[40] In order to live in the other world, the double required a body and this was why the original body was preserved. In case the actual body was destroyed images of stone or wood were made to supply its place. Besides the double, there was the soul—*bi,* or *ba,* and the *khoo,* which was a sort of divine spark. Each of these substances had to be provided for. It may have been some similar belief which led the early Peruvians to place foods and the common objects of every-day life about the bodies of their dead, while an element of force was assured by filling the mouth of the departed with Coca leaves. Even to-day the Indians of some provinces believe that if a dying man can appreciate the taste of Coca leaves pressed to his lips his soul will enter Paradise,[41] while in the graves where mummies have been found there is always a bountiful supply of Coca in the chuspa, and many little bags of Coca leaves are distributed over the body.

At the death of an Inca, when, as it was said, he was "called home to the mansions of his father the sun," his palaces were closed forever, while his estates were worked only sufficiently to support his immediate followers and servants, who continued in charge of his earthly remains, for it was supposed his soul would return to reanimate the body and all things should be left as in life ready for this reception.[42] The bowels of the dead sovereign were removed and buried, with a quantity of plate and jewels, at Tampu, five leagues from the capital, while the body was embalmed by some peculiar process which preserved it in lifelike appearance through centuries, and this, clothed in royal

38. 1 *Psalms;* cvi, 28.

39. Schoolcraft; 1853.

40. Maspero; *Historie Ancienne,* p. 55.

41. Poeppig; ii. 252, 1836.

42. Garcilasso; 1609.

raiment, was set up in the Temple of the Sun at Cuzco. Possibly it may have been a knowledge of this peculiar custom of the Incas which led Philip II to conceive the idea of a mausoleum, in which the bodies of the Spanish sovereigns should be petrified and set up as at the Palace and Monastery of San Lorenzo del Escorial. At the festivals in the public square, when the mummies of the Incas were brought out, it was customary for their followers to invite special guests, who enjoyed the melancholy festivities with all the etiquette due the living monarch.

The early Peruvians had the universal myth of creation through the union of a heavenly father and earthly mother, and though their ritual embraced many emblems, they certainly recognized a supreme being aside from this emblematic worship. Their venerated names were *Con, Illa, Ticci, Uira, Cocha* [43]—the Creator, Eternal Light, Spirit of the Abyss—together with two sacred terms which record attributes, as *Pachayachachic,* the teacher or regulator, and *Pachacamac,* the ruler of the universe, who created man and all living things. They distinguished an intelligent and immaterial soul—*runa*—from the body which the name *allpacamasca* designated as animated earth, and throughout all their teachings the belief is manifest that he who had well employed his time would at death go to *hananpacha*—the world above—to receive its reward; or, if bad, he would descend to *urupacha,* the world below. Because of the reverence the Incans had for their dead they respected all burial places, displaying much anguish at the disturbance of remains, yet the only knowledge that we have of these people has come to us through the constant search that is being made in the places of their interment, for antiquities and the wealth that is supposedly buried with their bodies.

The Incan cloths, which we have had opportunity of studying from the relics found in their tombs, were woven from the coarse llama fleece, or the fine silky wool of the vicuña, the latter being reserved for the royal garments. The materials were beautifully dyed with permanent colors tastefully combined, and exquisitely woven in complicated, though tasteful, patterns, in which animals, warriors and the Coca plant were all artistically concealed in the design. The Incas excelled in their manufacture of pottery, which is little inferior to that of the Greeks. Their vases occur in every variety of form, they are commonly moulded into water bottles and represent scenes, faces, animals, vegetables; and in fact every object known to the early Peruvians was reproduced in this artistic way.

43. *Con* is of unknown origin, *Illa*—light, *Ticci*—foundation, *Uira*—from *Uayra*—air, *Cocha*—lake.—Markham, p. 20, 1892.

All such antiquities are termed by the Peruvians *huacas*[44]—sacred. They are commonly found buried in the tombs of Incan nobles, and are much sought. The material—red, black or cream colored, is of the terra cotta order, polished and painted in design, or again rough. The examples which are known as portrait vases were doubtless excellent likenesses and would be creditable if they were done by modern artists. A keen and premeditated wit is shown in some of these designs, which is not merely the grotesque of inexperience. Many of the vases are modeled as caricatures, possibly depicting, in political satire, some local personage; others again represent various diseased conditions, as the small-pox, which has always been prevalent throughout Peru. There are others which are marked with syphilitic lesions, and some represent the swollen cheek and the agonized expression of suffering from a possibly ulcerated tooth, while others depict various ceremonies.

A curious vase in the private collection I inspected represents a rock, upon the top of which rests another rock, which seems to be capable of a lever movement, a possible instrument used in beheading victims, for a head and the headless body of a man are shown at the base, while another figure in a kneeling posture has his head bowed, as though awaiting decapitation from the fall of the small rock, which is apparently being worked by a figure standing at the side. This may illustrate some early form of capital punishment, though no mention of it is made in any of the works which I have consulted. Another form of punishment is shown by a vase representing an immense cactus of a species having digestive qualities of a phenomenal nature. Criminals placed in this gigantic plant were supposed to be literally digested and absorbed.

Some water bottles, that represent animals or birds, *silvadors*—or whistling jugs, as they are termed, were so cleverly constructed that a musical note is given in imitation of the cry as the water is poured out. A vase depicting the Coca harvest is in the form of a sitting woman with Coca branches and leaves around her. In many of the portrait vases the swollen cheek is represented as though containing the quid of Coca.

Treasure-hunting in Peru is not confined to prospecting for gold and silver, but also extends to a seeking for the riches which were presumably buried along with the bodies of the Incas; so that this much hunted race has not been permitted to rest in peace even in the grave. The *tapadas* or *huaqueros* as these relic hunters are called, con-

44. The derivation of the term *Huaca,* Garcilasso says, is from the verb which signifies to weep.

stitute a class of modern adventurers. In their search for *huacas* they prod the soil with a long pole, and when a sounding indicates some underlying tomb, it is opened and the bodies are strewn about in search for antiquities. These burying grounds are often in the open desert and in the sterile soil at the foot of the cliffs of the valleys, which extend to the sea, where there are many graves of the *antiguos;* they are here by thousands and perhaps millions. Even those who do not make a business of this hunt repair to these places on Good Friday and dig as a sort of popular amusement for that holiday, there being a legend that the *huacas* are enchanted, and while during all the rest of the year they are sunk so deeply in the ground as to make it impossible for them to be found, on Good Friday they come near the surface. It is remarkable that, though Coca is not to-day commonly used by the Indians on the coast, these graves all contain Coca among their relics. When these old graves are opened, although there is no apparent odor, those who explore them are very apt to get a very severe sore throat from inhaling the vapors or impalpable dust into which the bodies fall as they are exposed to the air. It has been long a custom to fortify against this condition by the use of Coca, thus illustrating the intuitive adaptation of a native remedy empirically, which it has required long years of study to since apply in a scientific way in the treatment of throat troubles.

Some of the relics that are taken out of these graves are worn as charms by the Indians. There is a supposition that many races may have been buried in these localities, as often the graves are situated directly over others of apparently different peoples. As a rule the bodies and their wrappings are well preserved, and it has been questioned whether this preservation is due to some process of embalming, or whether it is simply the result of the natron soil and extreme dryness. Various methods were followed in preparing the body for the grave. A child was usually wrapped in a coarse shroud, possibly a string of beads about the neck, with a little stick or plaything near at hand. Adults were usually buried in a squatting position, the head resting on the knees, the arms folded or supporting the head. Thus they were returned to Mother Earth in a position similar to that prior to their birth.[45] The body of the dead was covered with many wrappings—grave cloths of beautiful texture and exquisite coloring. About the mummy might be placed several pieces of pottery containing Coca or maize intended either to nourish the departed on his long journey or be ready for support on return. Near at hand were placed the implements and arms; and in the case of the women, the household utensils,

45. Wilson; 1876.

spinning appliances, and the work basket filled ready for use. Commonly there were bags of netting containing a supply of wearing apparel. The fancy pieces of pottery are usually found at the head of the grave, where are also found the little woven tablets designed to keep off evil spirits.

When the wrappings of the mummy are removed, the body may not only be found well preserved, but often the flesh has a lifelike appearance. Great care seems to have been taken to wrap the bodies in the richest possible garments, so that these tombs are veritable mines of antiquities. The head of the mummy is commonly wound with a fancy turban, and the body is bound with a white tunic, elaborately embroidered with flowers and figures. The wrappings of the men are usually the richer, those of the women being more simple, but the bodies of men and women alike are found adorned with necklaces and bracelets. Although all the Indian women of to-day weave and spin, their work in no case equals that of the ancient relics found in these graves, while the antique implements are all of far superior finish to those of the present time. The *orqueta,* a crotched stick upon which is held the *copo* or ball of material for spinning, is usually today a natural fork cut from some tree for this purpose, but those which are found in the tombs are cut from solid wood beautifully carved, inlaid and polished. The modern Indian women are in the habit of plaiting thick skeins of brown cotton into braids with their hair to prevent the ends from splitting, and a similar custom is shown by these examples to have been followed by the ancients. In some of the bodies of women the lower lip has been pierced and a silver cylinder about the size of a thimble has been inserted. The crown of this is usually set with a bloodstone, surrounding which are small pieces of coral, executed with a delicacy of workmanship which would be creditable to a modern jeweler.[46]

Unlike the Egyptian mummies, those of the Peruvians do not represent the exact position of the body. They are commonly in huge square bundles, much resembling a bale of goods were it not for a headlike appearance on the top. These heads are attached to the exterior wrappings, the eyes, nose, lips and ears being fastened to the bundle in representation of a face. Often these entire bales are bound with a netting of plaited rope, two pieces of which are apparently left to lower the mummy into the grave. Some such packs have been found that are five feet high. On the shoulders, breast and back there are commonly a number of little pouches fastened together, filled with Coca leaves, while strings of such bags are often found in the tombs.

46. Scott; *La Goya,* also *person. com.,* 1899.

Some of these mummies are found in the graves alone; in other cases there are several buried together. In some instances a large earthen vessel like a chicha jar, with the mouth broken off, is inverted over the mummy pack, evidently as a protection from the weight of earth above.

In the heights of the Western Andes there are many oven-like graves of adobe, and in the Sierra there are numerous graves found covered with huge piles of stone, some square, others oval. It is supposed that these monuments mark the resting places of important individuals or head of families, while the graves of ordinary personages were either in rows or semi-circles, or in terraces on the mountains. Many of these stone piles are similar to the dolmens and cromlechs which may be found all over Northern Europe. They are of every variety in shape and have existed from prehistoric ages. Carnac in Brittany, Rutzlingen in Hanover, Stonehenge and Aubry in England, the stones at Orkney and at Lewis in Scotland, are but a few examples of such stone piles, which, if not belonging to one period, doubtless belonged to one form of worship. Many of these are sepulchral enclosures surrounding tumuli or uncovered cromlechs, and several mark the confines of what are termed giants' graves. These Druidical temples were similar to the Greek and Persian stone circles, in the centre of which was kindled the sacred fire. Along the Mississippi Valley, from the Great Lakes to the Gulf of Mexico, there are numerous works of stone and earth mounds, some of which cover several acres. Like the remains already cited, these are supposed to be thousands of years old. In the Titicaca region there are a great number of these stone monuments, which are known as *chulpas*. In some cases these are round, while other examples are square, in either instance looking like huge, squatty chimneys or the air shafts over an aqueduct. The tops are commonly larger than the base, extending mushroom-like beyond the sides and picturesquely overgrown with a confusion of mosses and vines. The interiors are usually of rough stone laid in clay and faced with hewn blocks of limestone, the size of the structure varying from ten to twenty feet in diameter, and from twelve to twenty-four feet high. The bodies in these tombs are usually found sewn in llama skins, upon which are pictured human features. Over this skin there are commonly wrappings, but differing from those of the mummies found along the coast.

The early Peruvians had a peculiar reverence for stones, and many of their legends refer to them. One tradition describes Viracocha as having endowed certain stones with life, from which were made the first man and woman. This is suggestive of a tale in Grecian mythology, when Deucalion and Pyrrha—the sole people left after the deluge, repeopled the earth by throwing behind their backs "the bones of their mother," which was interpreted to mean stones. So the stones

thrown by the man took the shape of men, and those thrown by his wife became women.[47] The small round stones, which the Incas supposed to come from the thunderbolts, were said to have the property of producing fertility, and were regarded as love philters of remarkable efficacy. Throughout South America, between the 2° and 4° north latitude, there are thousands of rocks covered with symbolic representations, colossal figures of crocodiles, tigers and signs of the sun and moon possibly of different epochs.[48] Higgins [49] considers the examples of single unwrought stones to be emblems of generation. The Incans used to set up these single stone pyramids in their fields as protectors of their crops, and offerings were made to these as emblems—if not to propitiate a supposed spirit inhabiting them, as a mark of reverence or thanksgiving for guardianship. This practice is still continued, and it is in this spirit that Coca is commonly offered to such stones, because as that leaf is a prized object the Indian manifests his reverence in thus presenting something that is dear to him. Viewed in this light, such an action would seem no more idolatrous than for a Christian people to lay flowers on the tomb of their revered.

Among some specimens found among Incan relics are curious examples of trephined skulls. It is not known under what conditions this operation was performed, as similar examples have been found in various parts of the globe, and it would seem remarkable if these are merely accidental. Some of these skulls indicate that the subject had long survived the operation, while others appear to have been done after death. It has been questioned whether this operation was performed as a religious rite—a possible ordeal of initiation, or merely to make an opening to permit the imprisoned soul to escape from the dead body.[50]

Dr. Muñiz,[51] formerly Surgeon-General of the Army of Peru, a few years since made an extensive collection of crania from Incan graves, mostly in the environs of Lima. Among one thousand specimens there were nineteen trephined skulls, some of which bear evidence of several distinct operations on different parts of the cranium at different periods. The percentage of trephined skulls to all crania found would indicate a ratio frequency of this operative procedure higher than that of a modern military hospital. These specimens of primitive trephining, which have been examined and discussed by many learned socie-

47. Ovid; *Metamorphosis,* Fable x, Book i.

48. Humboldt; *Ansichten der Natur.*

49. *Celtic Druids.*

50. Broca; 1868.

51. Muñiz and McGee; 1897.

ties, are preserved by the Bureau of American Ethnology in the United States National Museum, at Washington, excepting one skull—showing a triple trephining, which has been placed at the United States Army Museum.

It was while the Incan Empire was at the height of its greatness that Huayna Ccapac, the twelfth Inca, after having governed for half a century, filled full of years and honors, retired to his favorite province at Quito, where he expected to spend his remaining days in peace. Realizing that the end of his career was approaching, and considering the vastness of his dominions, he determined to divide his kingdom between Huascar, his son by his lawful wife, and Atahualpa, the child of his favorite concubine. Just seven years prior to the Conquest this most mighty monarch of the line of Incas died.

The sad dissension between the two brothers, which was occasioned by this division of the Empire, and the unfortunate events which quickly follow to bring an end to this remarkable dynasty are told hereafter.

THE CONQUEST OF THE INCANS

Long before the discovery of Peru by the Spanish the Incas had so extended their empire that it reached from Chile in the south to Quito in the north. There was but one incentive to prompt this discovery, and that was gold. Indeed, gold was not only the beacon blazing from afar, but the shibboleth which led Francisco Pizarro on his voyage of conquest to the western shores of South America. Before this sordid search all else must perish; no sacrifice be too great, no device too flagrant, no torture too cruel to drag forth supposed secrets of hidden riches. The illegitimate son of a Colonel in the King's Guard, born in the town of Truxillo, in Spain,[52] and left a foundling, he is said to have rivaled Romulus by imbibing his early nutrition from a sow.[53] Grown to man's estate, uneducated save in the force of arms, he first appears in the history of the New World in 1509 in an expedition with Alonzo de Ojeda, who had been a companion of Columbus. Subsequently under Balboa he assisted in the establishment of the Spanish colony at Darien. Still later he was with Pedrarias, who founded Panama in 1519—and not unlike other foreign examples who readily fall into political preferment in the land of their adoption—he soon became a factor in the new city.

Rumors of fabulous wealth in some unknown country below the Isthmus had already floated toward this Spanish settlement, and proved a sufficient incentive to excite the roving nature of this adventurer into restlessness. Seeking means to further his purpose, Pizarro formed a partnership with two kindred spirits, Father Hernando de Luque, in behalf of the Licentiate Espinosa, and Diego de Almagro, the latter, like himself, an uneducated man, but a gallant soldier. Fitted out by this triumvirate, the first expedition sailed south in November, 1524, in two vessels, with a meagre crew of volunteers. One vessel was commanded by Pizarro, while the other, in charge of Almagro, was to follow with supplies. The expedition touched along the northern coast of South America, and met with an unexpected opposition from the natives, with whom the adventurers could not cope

52. The date of Pizarro's birth is not positive; Prescott gives it as about 1471.

53. Gomara; cap. 144; 1749.

because of inadequate force. After suffering from privation, and discouraged by the dreary aspect of the country, the Spaniards wished to return to Panama; but Pizarro, made of sterner stuff, endeavored to stimulate his men by indicating the treasures that were in store for them. When their sufferings had reached almost direful straits the first part of the expedition was joined by Almagro with some sixty or seventy men. The two commanders, while appreciating the hardships before them—for Almagro had also suffered by encounter with the natives, and had lost an eye—were yet so encouraged by their discoveries that they pledged themselves to die rather than abandon their undertaking. But in view of the formidable nature of their enterprise they thought it better to seek assistance from the government of Panama. At first the governor was not inclined to listen to what he considered the scheme of two rash adventurers, but through the plea of Father Luque, Almagro was permitted to solicit additional volunteers for the expedition. The seriousness of their prodigious undertaking was now sealed by a solemn compact made between the three—in which religion as the inspiring force, and plunder as the objective point, were commingled concerning an empire the situation and resources of which the plotters did not even know. Thus cloaked in a sincerity of religion, and with the sanction of the church, the cross was to be borne over this new land, and scathing and consuming as may have been the progress of this sign of man's salvation, it was to be enforced as the only sign by which generations yet unborn were to be rescued from perdition.[54]

It was not easy to raise a force for this second expedition, in spite of funds and the brilliant prospects of the enthusiasts; but finally two vessels set sail, each in command of one of the leaders and under pilotage of Bartholomew Ruiz, who was experienced in the southern ocean. After an uneventful voyage a landing was effected at a point somewhere on the coast of what is at present Colombia, where Pizarro and some of the men disembarked, and Almagro returned to Panama for supplies, while the other vessel under Ruiz continued south to explore the coast. This vessel soon fell in with one of the native raft-like boats, since known as *balsas,* which with a small crew displayed a rich cargo in full and tempting view upon the elevated platform raised above the deck. Here at last was a visible indication of the wealth for which the Spaniards had so long been in search. By friendly signs, and through cunningly entertaining the navigators of this novel craft, Ruiz was enabled to induce two of the people to return with him to Pizarro. His coming was none too soon, for the little band which

54. Prescott; Vol. I, p. 238; 1848.

had remained on shore was in sore distress and heartily discouraged from sickness and privation, and when Almagro arrived shortly after, the ardor of the adventurers had so cooled that all save the commanders were eager to return to Panama. Now, too, that the leaders of the expedition had learned from the natives of the land governed by a divine race termed Incas—descendants from the sun—and of the fabulous wealth throughout their vast domains, they realized how hopeless would be the attempt to conquer such a country with their small force. As a result of their consultation it was determined to dispatch Almagro again to Panama with such slight trophies as they might now return, to solicit sufficient forces to complete a conquest. But when the dissatisfied men learned of this proposed venture, and that there was a prospect of long suffering for those left in this desolate land, they concealed a letter of protest in a ball of cotton which was to be taken to the governor's wife as a specimen of the products of this New World. This letter concluded with a doggerel verse, which accused one of the leaders of driving in recruits like cattle to be butchered by the rashness of the other:

"Look out, Señor, Governor,
For the drover while he's near;
Soon he goes to get the sheep
For the butcher who stays here."

Pizarro, in order to check all possibility of flight, soon after Almagro's sailing despatched the other vessel with some few malcontents. Those who were left experienced the extremes of suffering from privation, and when two vessels arrived from Panama with an officer of the governor to bring back the Spaniards, all were ready to desert Pizarro except some few gallant followers, who remained as the first heroes of this historic expedition. Pizarro received letters from Almagro and Father Luque beseeching him not to despair, and promising their continued aid. This faint encouragement was sufficient for so plucky an adventurer, and drawing his sword he marked a line on the sands and assured his comrades that on one side was toil, hunger, nakedness, drenching storm, desertion and death—on the other ease and pleasure. On the one side was Peru with its riches, on the other Panama and its poverty. "Choose each man what best becomes a brave Castilian. For my part, I go to the south." And he stepped across the line, being followed by "Ruiz, Cristoval de Peralta, Pedro de Candia, Domingo de Soria Luce, Nicolas de Ribera, Francisco de Cuellar, Alonso de Molina, Pedro Alcon, Garcia de Jerez, Anton de Carrion, Alonso Briceño, Martin de Paz, and Joan de la Torre." [55] But the

55. Prescott; Vol. I, p. 261; 1848.

governor's messenger refused to acknowledge such rashness, and barely consenting to leave some scanty provisions, sailed for Panama, accompanied by Ruiz, who returned in order to co-operate with Almagro and Father Luque. Their conjoined remonstrances, and protests that the expedition was for the benefit of the crown, finally induced the governor to consent that a small vessel should be fitted out for relief.

Meanwhile Pizarro was encamped with his meagre band upon the Island of Gorgona, off the northwest coast of Peru, and here they remained for seven months, and even continued their discoveries by means of a raft which they constructed, a form of navigation they were quite ready to abandon on the arrival of the new vessel. Thus favorably equipped, they at once set sail for the south, and after twenty days dropped anchor at the Island of Santa Clara, in the Bay of Tumbez. Tumbez was then next to Quito, the most important city on the northern border of the Incan empire, and here the first exchange of visits took place between the officers of the expedition and some Incan inspectors, who ever on the alert to report to their sovereign the doings of each province, manifested a desire, through many courtesies, of learning the particulars of so mysterious a visitor to their waters. They offered fruit and game, and presented a llama, which the Spaniards termed "a little camel." Emboldened by these peaceful overtures, Pizarro continued down the coast as far as Santa, being everywhere cordially received and lavishly entertained by the natives, for hospitality was one of the first tenets of the social system of the Incas.

After an absence of eighteen months the commander was prevailed upon to return to Panama and report the result of his discoveries, which he was inclined to do in order to perfect plans which might enable him to conquer this vast territory. Two native boys were taken with him, and one of the Spaniards, at his own request, was permitted to remain at Tumbez, so that an interchange of language might add to the success of a return venture. Arrived at Panama, Pizarro excited the greatest interest as the result of his prospecting. The governor, however, refused to take the sole responsibility for so stupendous an undertaking, and it was determined that the success of the enterprise required the sanction, if not the co-operation, of the Spanish court. To assure this it was deemed advisable that Pizarro should personally explain his plan to the King, and he was despatched to the mother country to solicit the royal protection and aid.

So earnest were his representations, and so favorable were the gifts which he had taken as exhibits of the new land, that in July, 1529, permission was granted Pizarro to raise a force of not less than two hundred and fifty men with which he was to conquer this wonderful

country for his king. Here the natives were to be converted and the true church established, provided a fifth of all the gold found in this new world should be sent as an allegiance to the crown for this royal privilege. To emphasize this favor Pizarro was permitted an important addition to his paternal escutcheon, was decorated with the red cross of Santiago, and appointed Governor and Captain-General over the new country in prospective. Almagro was created commander of the fortress at Tumbez, and Father Luque was made bishop of that same place, which he was never destined to see; Ruiz was given the title of Grand Pilot of the Southern Ocean, while the gallant band who had remained loyal to their leader under the privations of the expedition were made "gentlemen of coat armor."

These facts may seem a trifle dry, but as they form the framework—the anatomical basis—upon which subsequent events were shaped, perhaps their brief relation may not seem inopportune. For these invaders did not simply overthrow the existing government and permit native customs to continue under a new control, but they attempted to annihilate not only the people but their customs and traditions. That there has remained any historical data must demonstrate the firm establishment of this former empire, an endurance that is further displayed by the survival of those native products the use of which is now enjoyed throughout the world, prominent among which is Coca so intimately associated with the Incan race.

Under royal approval and with a small grant of money from the crown, Pizzaro having enlisted his four brothers, made preparations to depart from Spain. Although he had not secured a full complement of men, he hurriedly sailed from Seville, January, 1530, for Panama, where after a consultation with his associates the final preparations for his expedition were completed. Church and State went so intimately hand in hand in those days that when in the following year the temporal plans had been got in readiness, the banners were blessed, the men were consecrated to their work against the infidel, and the expedition, which now consisted of three ships, sailed with some one hundred and eighty-five men and twenty-seven horses. After thirteen days a port was made in the most northern province of Peru, where the troops were landed with orders to march south, while the vessels continued on a parallel course with them. Force of arms was now openly resorted to, the smaller coast villages being successively overcome, and the captured wealth at once despatched to Panama as the first fruits of an assured success and an indication of the fabulous treasures which might be expected to follow. It was not long before Pizarro learned of the dissension between the brothers Huascar and Atahualpa, and the weakened government occasioned by this scission.

His own forces having been strengthened by an arrival of volunteers from Panama, he determined in some way to shape this opportunity to his advantage.

In November, 1532, hearing that Atahualpa, with his army, was in the neighboring mountains, Pizarro crossed the desert of Sechura, and a sort of triumphal march was continued toward the interior directly to the Inca's camp. As his troops passed on, the natives were baptized into the church, and assumed solemn vows which they could not understand, but it was sufficient that they had accepted the faith. Atahualpa learning of Pizarro's approach—presumably supposed that so small a body could only be coming upon friendly terms—so sent a messenger with greetings to inform him that the Inca would on the following day visit him in person. In the meantime the freedom of Caxamarca was extended to the invaders, and the use of the public buildings was offered for the troops.

Pizarro concealed his forces while awaiting the sovereign, who was borne in great state upon the royal litter. He was clothed in Incan splendor, a *chuspa* of Coca hung at his side, golden sandals were upon his feet, and his head bore the stately insignia of power—the *llauta* and *borla* of scarlet fringe, with the royal feathers of the sacred bird. He was accompanied by a numerous retinue of nobles of his court and thousands of followers. Friar Vicente de Valverde, the ecclesiastical head of the Spaniards, acted as spokesman, and explained through his interpreters that their little band had visited this far-off land for the sake of establishing the true religion and converting the natives. He beseeched the Inca to at once acknowledge the faith and allegiance to the king, Charles the Fifth. Authority for all this he attempted to show in a Bible which he offered to Atahualpa, but the latter, saying he recognized no other king than himself, indignantly threw the book to the ground, which the vengeful friar seemed to recognize as an affront sufficient to provoke hostilities, for he shouted, "Fall on! I absolve you," when at once the most terrible onslaught upon the unsuspecting Incas was commenced. The Spanish officers being mounted, were enabled to do some frightful work, while the troops, armed with death-dealing arquebuses, literally vomited fire upon the natives, who were massacred by thousands,[56] while not one of the invading party was injured save Pizarro, who received a slight wound from his own men while shielding the Inca, who was taken prisoner. The monarch was at first treated with courtesy, and permitted to retain his people about him. Pizarro, ever awake to some politic move, hinted upon the advisability of adjusting the affairs of the brothers

56. Ten thousand, Garcilasso said; Pizarro's secretary said two thousand.

amicably, but the imprisoned chief, not realizing his own danger, became alarmed at such a suggestion, and secretly despatched orders to assassinate Huascar, who was then a prisoner in Atahualpa's army. Nor had his brother received very courteous treatment at the hands of the rival forces, for they put a rope around his neck and called him *Coca hachu*—Coca chewer—besides offering him many other affronts, while they gave him Chillca—*Bacchaus scandeus* leaves to eat instead of Coca. This so outraged Huascar that he raised his eyes to heaven and cried: "O Lord and Creator, how is it possible? Why hast thou sent me these burdens and troubles?" [57]

Now commenced the downfall of the Empire of the Incas. Atahualpa, chafing under restraint, suggested paying for his ransom with as much gold as the room in which he was imprisoned would hold; and as that space was seventeen feet broad by twenty-two feet long, and was to be filled to a height of nine feet, the Spaniards were only too ready to agree to his proposition. But even their most sordid expectations had not pictured the vast store of riches which, at the command of the Inca, was at once brought to them from all sections of the country. It literally poured in a golden stream of vases, vessels, utensils, ornaments, the golden Coca shrubs from the temples, immense plaques, and golden animals, and statues of life-size, and in nuggets and golden dust. All this did not seem enough to satisfy the greed of the conqueror, who determined to expedite matters by seeking the source of this golden supply for himself. Instead of freeing Atahualpa, who had shown too keen a wit to be permitted at liberty, it was decided to make away with him. He was charged with the murder of his brother, and after a hasty trial was condemned to death. In August, 1533, after receiving the last rites of the Church, he was executed in the square of Caxamarca by the *garrole*, as a distinctive torture to being burned alive in consideration for his having at the last moment submitted to baptism. The following day, amidst the most impressive solemnity, the service for the dead being performed by Father Valverde, the body of the Incan sovereign was buried, Pizarro and his principal cavaliers assuming mourning as hypocritical emblems of their grief at the loss of this mighty lord. The greatest lawlessness now commenced and booty was free among the Spaniards. Villages were destroyed, houses were ransacked, and the gorgeous temples and palaces were plundered.

Pizarro advanced rapidly to Cuzco, but little of its golden splendor was now left. The cupidity of the invaders had over-leaped itself, for as the Peruvians saw that the sole desire of the Spanish was for gold,

57. Ondegardo; 1560.

they secreted the beautifully wrought golden emblems of Coca and other elaborate workings of the precious metal, together with the sacred vessels and the venerated bodies of the Incas which had been set up in the Temple of the Sun. From that day to this these treasures have never been fully recovered, although some years later Polo Ondegardo, while Corregidor of Cuzco, found five mummies in a tomb in the mountains, three of them men and two women. These were said to be the bodies of the Incas Viracocha, Tupac Inca Yupanqui and Huayna Ccapac, together with Mama Runtu, the queen of the first named, and Ccoya Mama Ocllo, mother of the last. Each of the bodies was well preserved, even the hair with the eyebrows and lashes remaining, while the peculiar wrappings and the sacred *llauta* about the forehead, betokened their rank. These bodies were conveyed to Lima, where they were buried with appropriate rites in the courtyard of the hospital of San Andres.

When the first vast treasure of capture was divided among the officers and followers of the conquerors, each of the invaders was allotted a fortune, and Hernando Pizarro was despatched to Spain with the royal fifth. The amount taken to the Crown proved sufficient to establish this new country in the name of the king, who magnanimously divided it into New Castile in the north, which was assigned to Pizarro, and New Toledo south of that, which was given to the control of Almagro. So gloated were the Spaniards with their newly acquired riches that the most ordinary commodities were paid for in fabulous sums, and many anecdotes are related of this prodigality of wealth. The men fell into riotous living, spent their days in lawlessness and their nights in gambling, the stakes at these bouts often being for whole fortunes. In one of these orgies the massive emblem of the Sun, taken from the Temple at Cuzco, was staked and lost at a single throw by the cavalier to whom it had fallen in the division of the spoils, from which an after allusion of arrant profligacy was referred to as: "He gambles away the sun in a night." [58]

It is recorded that when Atahualpa was imprisoned one of the priests wrote the name of God at his request upon the Inca's finger nail. This he showed to several of the guards, who, upon their pronouncing the name correctly, it excited his admiration and astonishment that characters so unintelligible to him could be read by the Spaniards. On showing the name to Pizarro—who could neither read nor write—he remained silent, and by thus displaying his ignorance provoked a contempt which his prisoner could not well conceal. It has been asserted

58. *Juega el Sol antes que amanezca;* Garcilasso; 1609.

that it was pique at this incident that determined an approval to the Inca's death.

The Empire of the Incas being now without a chief, fell into confusion, and the governors of the several provinces each set up an independence, which Pizarro was quick to appreciate would be more difficult to overthrow than to conquer the country under one revered ruler whom he might influence through stratagem. He therefore determined to install Manco, the legitimate brother of Huascar, who had already placed himself under his protection, and he was established as the successor and sovereign Inca amidst all the ancient splendor and formality that such an occasion might demand. So much harmony had been occasioned by this shrewd course that it now seemed as though the whole country might proclaim allegiance to Pizarro's guardianship, but the avarice of the invaders had not yet been appeased by the gold they had received. Their persistent search for treasure, which did not respect even the sacred buildings and palaces, proved to the Indians the new religion was not one of peace, but rather suggested they were to be reduced from their former freedom and happy state to become the mere slaves of a body of tyrants. A succession of internal wars now commenced, and the Incas, led by Manco, took a final stand at Cuzco, which they battled so nobly to defend that for a time it seemed the Spaniards must be routed, but the ultimate result was the complete overthrow of the Incan Empire, and Manco, chagrined and humiliated by his defeat, escaped to the mountains near Vilcabamba, where he maintained a sort of regal independence with a few loyal followers, until his death in 1544. After the overthrow of Cuzco, Pizarro, desiring a location near the coast in easier communication with Panama, established the seat of his government on the river Rimac, and the new capital was named *Ciudad de Los Reyes*—City of the Kings—in honor of the sovereigns of Spain, the modern name, Lima, being a corruption of Rimac.

And here the conqueror, enthroned in power, took to him Añas, the daughter of Atahualpa, by whom he had a son—Francisco, who became a schoolmate of the Incan historian, Garcilasso de la Vega, but died young in Spain. As though to unite his name more profoundly with the Incan race, Pizarro took also the sister of Huascar, who bore him two children, a son, who died young, and a daughter, Francisca, who in after years married his brother, Hernando, in Spain. As if by marriage and intermarriage the invaders might atone for the destruction of a mighty race.

But let us see how fared the partners and adventurous companions of the conqueror. Father Luque never enjoyed the fruits of the success

of his partners, for he died a few months after the final expedition started from Panama; while Juan Pizarro was killed when the Incas, under Manco, besieged Cuzco in 1536, in defense of which the several brothers were engaged. Almagro, who early fell into dissension with Francisco, was executed in Cuzco at the command of Hernando Pizarro in July, 1538; and so a bitter feud was originated between the people of Chile, who were followers of Almagro, and the people of Northern Peru, who were followers of the Pizarros—which almost rivaled the stories of the Corsican vendetta. It was not long after this that Francisco Pizarro was cruelly assassinated while dining with some friends by the cohorts of Chile, while his brother, Hernando, who had sought refuge in Spain, was imprisoned for twenty years on account of his execution of Almagro. After Francisco's death his brother, Gonzalo, placed himself at the head of a faction and assumed government, although the Crown had already sent a commissioner to take charge of Peruvian affairs. As a result of the rebellion which followed, Gonzalo was beheaded at Cuzco, in 1548, and Valverde, who had been the ritualistic light of the conquerors, was killed by the islanders of Puna.

It seems incredible how so mighty an empire could be destroyed so that the landmarks even were almost obliterated. But the solution of this is found not so much in the valor of the Spaniards as in the utter demoralization of the Peruvians through a succession of reverses. The Incans, while at first confounded by the division of their country under two heads, became almost helpless when the final loss of the leaders of both sections occurred, for they had been educated for hundreds of years to look upon their sovereign as divine and all-powerful. With the downfall of the Peruvians, Spain's interest in the new country was stimulated to excitement by the vast wealth which she had received and the still greater riches that had been reported. There, too, was the hope of finding El Dorado, that mythical city which existed somewhere in the interior of the country, where the streets were paved with gold and where the native king was every morning powdered with gold dust. This all seemed so great a treasure that the Crown determined to assume direct control by the appointment of a viceroy. In 1543 this form of government was instituted, and from this period commenced the persecution and oppression of the conquered Indians until they were reduced to abject slaves. Innumerable edicts were issued concerning them, and their government seemed to form a prominent plank in the political platform to influence the legislation of that day. In fact the privileges of the Indians between good and bad fluctuated in accordance with the whims or aspirations of the party in power. At one time the fact that the conquerors were deprived by edict from the personal service of the natives as slaves

occasioned a rebellion, while for years the Indians were a source of perpetual warfare, of which they remained the innocent victims, their peaceable disposition not even being awakened to an uprising such as their ill treatment might have well provoked, yet kept them constantly suspicious. In the year 1560 it was supposed by the Indians that an ointment made from their bodies had been sent for from Spain to cure a certain disease for which there was no other remedy. This belief made these people very shy of the Spaniards at that time, fearing that they might be taken in and boiled down into this necessary unguent.[59] A succession of dread as a result of abuse and oppression resulted in a stolid hatred directed not only against the Spanish but toward all white persons, that is still manifest through the reticence of the Peruvian Indians of to-day.

It was during this long period of oppression that Coca was attacked because it was so esteemed by the Indians, and numerous edicts were issued by both Church and State forbidding its use and even seeking to exterminate the plant. Particularly was this so under the rule of Francisco de Toledo, the fifth viceroy, a man devoted to his sovereign, but narrow-minded and unsympathetic. During his rule there were some seventy *ordenanzes* issued concerning Coca. After his appointment in 1569 he made a tour through the country to determine the exact condition of affairs, and to study the customs of the natives. In this he was accompanied by Father Acosta, the Judge Matienzo, and Polo de Ondegardo, each of whom has left valuable works regarding the traditions and early customs of the natives upon which most of the subsequent writings have been based. Toledo seems to have determined to stamp out all Incan traditions, and to change completely the habits of the natives in conformity with his own ideas as to what Spanish subjects should be. He established the imposition known as the *mitta*,[60] a personal tax upon the Indians, which necessitated a certain number from each province to submit themselves to the control of the Governor for such work as he might assign them, at so small a pittance, $14 to $18 a year, that their labor was virtually slavery. This had grown out of the old system of common labor for the State during the Incan period. These Indians, known as *mitayos*, were assigned to service over every part of the country except the coast, where negro slaves were employed. They were compelled to work in the mines in the mountains, and in the cocals of the montaña to cultivate their precious plant for the benefit of their foreign conquerors. This enforced labor was prompted through a desire to send all possible

59. Molina; 1570.

60. *Mitta* in Quichua signifies time, or term.

riches home to Spain; and so brutally were the Indians driven to their tasks that in a century nine-tenths of these people had been destroyed by overwork and cruelty.[61] The owners of the *obrajes*—where the coarse cloths were woven, employed men called *guatacos* to hunt the Indians and compel them to work for a mere pittance, while the poor victims were driven into an indebtedness for necessities, which being advanced kept them in perpetual slavery to their masters.

In 1569 the Spanish audience at Lima, composed of bishops from all parts of South America, denounced Coca because, as they asserted, it was a pernicious leaf, the chewing of which the Indians supposed gave them strength and was hence: *"Un delusio del demonio."* [62] The prejudice and abhorrence of the Spaniards was not only directed against Coca but against any custom of the Indians. This is shown by the following story, related by Garcilasso, the Incan historian, writing from abroad: "I remember a story which I heard in my native land of Peru of a gentleman of rank and honor named Rodrigo Pantoja, who, travelling from Cuzco to Rimac, met a poor Spaniard, for there are poor people there as well as here, who was going on foot, with a little girl aged two years on his back. The man was known to Pantoja, and they thus conversed: 'Why do you go laden thus?' said the knight. The poor man answered that he was unable to hire an Indian to carry the child and for that reason he carried it himself. While he spoke Pantoja looked in his mouth and saw that it was full of Coca, and as the Spaniards abominate all that the Indians eat and drink as though it savored of idolatry—particularly the chewing of Coca, which seems to them a low, vile habit, he said: 'It may be as you say, but why do you eat Coca like an Indian, a thing so hateful to Spaniards?' The man answered: 'In truth, my lord, I detest it as much as any one, but necessity obliges me to imitate the Indians and keep Coca in my mouth, for I would have you know that if I did not do so, I could not carry this burden, while the Coca gives me sufficient strength to endure the fatigue.' Pantoja was astonished to hear this, and told the story wherever he went; and from that time credit was given to the Indians for using Coca from necessity and not from vicious gluttony."

Salorzano,[63] a Spanish jurist, says that the *mittas* of Indians were prevented from working the cocals owing to the reported unhealthfulness of that section of the montaña by an edict of October 18, 1569. The words of the law are as follows: "As the country where Coca is grown is humid and subject to rain, and the Indians in their work

61. Markham; 1892.

62. *Cédula* of October 18, 1569.

63. *Polit. Ind.*, lib. ii, cap. 10.

generally get wet and then fall ill from not changing their wet clothes, we command that no Indian shall commence work in that land without being provided with a change of clothes, and the master of the Coca plantation must take especial care that this be done under a penalty of paying twenty baskets of Coca for each time that he may be found to bring any Indian to this work without complying with the regulations herein set forth." Finally Toledo permitted the cultivation of Coca with voluntary labor, on condition that the Indians were well paid and that care was taken of their health.

Besides the *mitayos*, some of the Indians, who were known as *yanaconas*, were bound to personal service—literally household slaves, a custom that had been continued from an early Incan period.[64] In Toledo's time this class numbered some forty thousand who were assigned to the Spaniards as servants.

Toledo enacted some very rigorous laws affecting the Indians. Among these was one condemning any Indian who married an idolatrous woman to receive one hundred lashes, because, says the edict, "that is the punishment which they dislike most." No Indian who had been punished for such an offense, or for engaging in any infidel rites, was eligible for any public office. The poor Indians were prevented from even choosing names for their children after birds or natural objects, as had been their ancient custom. Together with this oppression from the State was the authority of the Church, which exacted compulsory attendance at its services and observances of all its festivals; not only a personal observance, but a practical one as well, which necessitated the payment of large fees for every office. The Pope had no power over the South American clergy, the king being the virtual head of the Church, while the archbishop ranked next to the viceroy and in his absence acted in his stead.

The Church, with its numerous dignitaries, had representatives in every hamlet, with absolute control over the education of the Indians. Indeed, the Spanish were not slow in educational matters, the University of San Marcos, which is the oldest in the world, being founded at Lima as early as 1551, and there were other colleges for the descendants of the conquerors, for the sons of the Incas, and for the students of the Church, with similar institutions at Cuzco, at Arequipa, at Truxillo, and Guamanga, all founded at an early date.

Among the rigorous rulings of the Church, the people were obliged to provide supplies for the several feasts in commemoration of saints, as well as offerings to the priests on Sundays, which, in lieu of money,

64. Inca Tupace Yupanqui granted a pardon to captive rebels at Yana-Yacu on condition that they should act as servants. These were known as *Yana-Yacu-Cuna*, which term was corrupted to *yanaconas*.

were paid in Coca or other products of their industry. It is reported that one priest extorted in this manner two hundred sheep, six thousand fowls and fifty thousand eggs in one year. On the death of a member of a poor Indian's family, the rites of the Church were refused until a good sum had been paid for the service. In default of voluntary payment the Indian's goods were seized. The clergy lived very immoral lives; and in addition to their personal extortions from the Indians, their concubines compelled the women to work for them. There was ever a constant greed shown toward all the effects of the natives, as the following story will illustrate: An Indian stopping at a tambo, and having no money to pay for his entertainment, left as a pledge with the woman in charge a number of antique golden figures, which he promised to redeem to the extent of his indebtedness upon his return, exacting from her a promise that she would show these articles to no one. The woman subsequently being in need of money, gave the *huacas* to a priest as pledges, and when the Indian returned for them he was thrown into prison and compelled to confess that he knew of an Incan treasure, but if they dug for it, as he would indicate, the water would cover the valley where it was hidden. On search being made, it is said that a treasure of $2,500,000 was found, but the water, as he had predicted, rushed into the excavation, and the place, called Manan-Chile, is at present covered by a lake, in the centre of which is a small island.

Indians were excluded from all the higher occupations by a decree of the Count of Moncloa, who was the viceroy in 1706. No Indian, *mestizo*—half white and half Indian, negro, mulatto, or *zambo*—half Indian and half black, was permitted to have a shop for the sale of goods or even to traffic in the streets, but they were all confined absolutely to agricultural or mechanical labor. The public and military offices were all occupied by Spaniards, who maintained an insolent pride toward the creoles. The policy was to crush out all freedom of thought as well as of action in the last remnant of the Incan race. There was one redeeming feature in the Spanish cruelties, the exemption of the Indians from the jurisdiction of the Holy Inquisition, which was established in Peru in 1569 by Philip II, and which was exercised by the most terrible cruelties inflicted for often the most trivial offense.

The drain on the treasury of the home government through her countless wars necessitated a continual demand for money, and the poor *mitayos* were sent to the mines and literally worked to death in an endeavor to satisfy this constant cry for gold. The laborers were so beaten at their tasks that the punishment seemed so much a necessary part of their existence that if they did not receive it they felt that their masters no longer loved them. In the mills work was commenced

before daylight, and the slaves were locked in until dark, when those who had not completed the task that had been assigned them were cruelly punished. Thus this race became gradually debased into abject slaves, and gold, which had been poetically termed by the Incas "tears which the sun shed," might well have been corrupted into tears of darkness and toil!

At the height of its prosperity the Incan population numbered some ten million souls, but the system of serfdom so reduced its people that at the time of the census made by Archbishop Loaiza, in 1580, there were but 8,280,000 which to-day has dwindled into less than two millions. The poor Indians had a hard taskmaster under Spanish rule, and it was not until Peru was declared independent in 1821 that the system of slavery, known as the *mitta*, was forever abolished by law. There was still another abuse to which the Indians were subjected. They were compelled to buy useless things from the Spanish stores, which not only consumed any little savings they might have, but forced them into an indebtedness from which they were compelled to work in order to gain freedom. Under the pretense that they were being supplied with necessary goods at unusually advantageous prices, the most absurd things were imposed on them, such as fine silken hose for a barefooted Indian girl, silks, velvets and laces for the Indian's wife, padlocks to lock up what they never possessed, razors to shave beardless faces, and at one time a job lot of spectacles was distributed, through an edict that no Indian should appear in church unless wearing these necessary adjuncts to seeing the true light. The policy of the masters was to keep the Indians in debt to them—a custom that still continues—it being an established law that an Indian shall not leave his master so long as he shall be indebted to him; and, indeed, he could not find employment elsewhere so long as he is hampered by this incubus, so that the only way to escape from a life of continued slavery is to run away to some other part of the country, where the same system is continued and the weight of indebtedness is gradually assumed anew.

Excessive duties were also established against harvests to increase the revenue. The *alcabala* was an excise duty of two per cent, on all provisions sold in the market, which in the case of Coca extended to five per cent. Acosta wrote that in his time the Coca trade at Potosi was worth five hundred thousand dollars annually, and that in 1583 the Indians consumed one hundred thousand *cestas* of Coca, worth two and a half dollars each at Cuzco, and four dollars at Potosi. Borja y Arragon, who, by his marriage, became Prince of Esquilache, reports that in 1746 the excise of 5 per cent imposed upon Coca yielded eight hundred dollars from Caravaya alone, while between 1785 and 1795 this Coca tariff yielded a revenue to the Peruvian vice-royalty of

$2,641,487. This oppressive tax occasioned an insurrection in Quito, which was put down and the excise rigidly enforced.

Linnaeus gave the name of cinchona to various species of precious trees[65] found throughout the Eastern cordillera of the Andes for a distance of two thousand miles, along the same curve where Coca is grown. Unlike Coca, it is not cultivated but is found in its native home deep in those forests and glens which are situated at an altitude of from 1,000 to 2,000 metres (3,280 to 6,560 feet). The *cascarilleros,* as the collectors are known, undergo great hardships in gathering it. They are usually half civilized Indians, and often they are cheated out of their just claims, the price of the bark being regulated by law. The forests where cinchona is gathered are extremely unhealthful; the temperature, usually about 70° F., does not vary two degrees during the day, while at night, when there are usually rains, it falls perhaps eight degrees. The cinchona tree grows slowly, requiring a man's lifetime to reach perfection. Often carelessness in gathering destroys the trees, which are forever lost. The Indians who gather the bark get sick from exposure in the malarial regions into which they must penetrate, and the *cascarillero* looks to his Coca as a more ready means of sustenance and relief than is the recognized specific which he is engaged in collecting, for the Indians regard Coca as a remedy against malaria superior to quinine.[66]

The Spanish oppression in Peru, as has been seen, was cruelly severe; the once happy and peaceful Incas were forever destroyed. The progress and advanced socialism of these early people was engulfed in an onward rush of what was supposedly a higher civilization. It is suggestive of the old fable of the boys and the frogs, for while it was a good thing for Spain, it was death to the Incans. It is even questionable whether the Spanish Conquest was advantageous to Peru,[67] though as a slight compensation in exchange for her riches—for plants and products of inestimable value, she has received from Spain the domestic animals, wheat, the vine, sugar cane, the olive, the date and many fruits. If Spain did not feel she had done an injustice, at least there were some among the conquerors who viewed matters in that light. When Marcio Sera de Lajesema, who was the last of Pizarro's original party, died he left a will which expressed this sentiment as his personal view of the Spanish invasion. This portion of the will, which was admitted to probate at Cuzco, November 15, 1589, reads:

65. Cinchona bark is the botanical source of quinine, a dramatically effective antimalarial drug.—Eds.

66. Markham; p. 53, *et seq.;* 1880.

67. Reclus; 1886.

"First, before beginning my will, I declare that I have desired much to give notice to His Catholic Majesty, King Philip, our lord, seeing how good a Catholic and Christian he is, and how zealous in the service of the Lord our God, concerning that which I would relieve my mind of, by reason of having taken part in the discovery and conquest of these countries, which we took from the lords Yncas, and placed under the Royal Crown, a fact which is known to His Catholic Majesty. The said Yncas governed in such a way that in all the land neither a thief, nor vicious man, nor a bad, dishonest woman was known. The men all had honest and profitable employment. The lands and mines, and all kinds of property were so divided that each man knew what belonged to him, and there were no lawsuits. The Yncas were feared, obeyed and respected by their subjects, as a race very capable of governing, but we took away their land, and placed it under the Crown of Spain, and made them subjects. Your Majesty must understand that my reason for making this statement is to relieve my conscience, for we have destroyed this people by our bad examples. Crimes were once so little known among them that an Indian with a hundred thousand pieces of gold and silver in his house left it open, only placing a little stick across the door, as a sign that the master was out, and nobody went in. But when they saw that we placed locks and keys upon our doors, they understood that it was fear of thieves; and when they saw that we had thieves amongst us, they despised us. All this I tell your Majesty to discharge my conscience of a weight, that I may no longer be a party to these things. And I pray God to pardon me, for I am the last to die of all the discoverers and conquerors, as it is notorious that there are none left but me, in this land or out of it, and therefore I now do what I can to relieve my conscience." [68]

68. *Calancha,* lib. i, cap. 15, p. 98, quoted in Markham; *preface to Cieza.*

THE PHYSICAL ASPECT OF PERU

Many miles and many conditions intervene between the gathering of Coca from the cocals of the montaña on the eastern slope of the Andes until its ultimate consumption by the millions of people throughout the world, who now find in it solace and power. The physical aspect of the mighty Andes must still be much as when our first knowledge of them begun, for though time changes even these sturdy mountains their stupendousness remains, while conditions for transportation and for subsistence seem by comparison more severe. Fully as wonderful then as the associations of Coca with the arts and customs of the Incas, are the prodigious heights and sublime trials to which those who work, who gather and who transport the little leaf are subjected. Care in cultivation, the importance and perplexities of harvesting, and the problem of the final preparation for shipment, are as nothing when compared with the long, toilsome and even dangerous journey through which Coca must be conveyed to the coast.

We may perhaps better appreciate this in a review of some of the topographical difficulties which this marvelous leaf has to pass in transit; and as such landmarks and features as have determined the peculiarities or wealth of this historic home of Coca are presented, let us also consider these. Each of these factors is of importance as tending to shape the habits of the people we are studying, and may prove interesting, if not wholly essential, for a proper appreciation of the dependence placed by them on Coca as the means of surmounting every difficulty. In doing this we may best trace the path of travel from the ocean which washes the shore of this golden land, across those perilous and barren rocky steeps and lofty fertile plains, to the luxuriant fields beyond of perpetual verdure, where Coca is ever growing, ever blooming into one continuous harvest of pent-up endurance.[69]

From Panama to the equator the coast is green, but the Peruvian shores are as desolate and barren a view as ever human eyes, which have anxiously looked for land, beheld.

This is a land of prodigious distances, extreme heights and gigantic

69. There are at least three and commonly four harvests a year, so that it is almost continuous.

proportions, so it may not seem remarkable to speak of the Andes as extending through Peru for a thousand miles, nor to allude to towering elevations for thousands of feet. The Andes are commonly described as in two ranges, but this arrangement depends wholly upon the locality. In northern Peru above the latitude of Lima there are V-shaped projections from the cordillera which form shorter ranges, while in southern Peru a bird's-eye view of the country appears like a succession of petrified whirlpools. Spurs and knots abound in every direction, so that the whole lower country is a succession of mountains and basins and valleys. The western cordillera, sometimes termed the "maritime" or the *cordillera de la costa*—runs parallel with the coast, while separated from that by erosion is the central chain; and still further east is the *cordillera real*, which is commonly described as the Andes proper. The eastern range is broken in the north into several V-shaped formations, between which lie the forests of the northern montaña, while east of the entire range extends the low flat stretch of the Amazonian valley for thousands of miles to the Atlantic. The coast chain is a bleak, untimbered range of barren rocks, above which is a belt of some hundred miles broad, cold and desolate, known as the *puna*, across which the traveller is glad to hasten. It is to this varied configuration of mountain that Peru owes its marvels of climate.

Although we must consider Peru as a country of infinite phenomena, its most remarkable feature is its climate, for it presents every variety on the globe from the Equator to the Polar regions. Here one may have a choice, from the blazing suns of the desert, through the bleak and cheerless *puna* to the delightful equable climate of the Sierra; from the heat and humidity of the tropical home of Coca to the perpetual spring of the table lands; from everlasting winter upon the mountain tops to never-ending summer in the higher valleys. These changes vary with the elevation, and are not materially affected with the seasons, but remain in each locality nearly the same throughout the year, each gradation being happily displayed by Nature in the vegetation which, through successive altitudes, represents the product of every country on the earth; so that a trip across the Andes to the cocals of the montaña does not necessitate, like some other journeys, a wait upon time, unless deterred by the swelling of mountain streams during the rains. The traveller may pass from one season to the other, through every change of heat and cold, from temperate vegetation to tropical luxuriance; from wintry storms to sunshine. Particularly in descending the Eastern slope is this transition noticeable, when one may sit down to cool off from the exertion and excessive heat of a summer's day, which a profusion of tropic flowers, gorgeously tinted butterflies and sweetly warbling birds assure as a reality, while the

melting snow upon hat and shoulders drips down to recall those wintry blasts which were but shortly left above and behind.

At Arequipa the traveller usually spends a few days to become accustomed to the change before proceeding to higher altitudes. This is the second largest city of Peru, and is the distributing centre for the whole southern country. It is crowned by the lofty volcano of Misti, which, with a height of over 20,000 feet, looms up imposingly in the background, while Pichu-pichu, 17,800 feet, Charchani, 19,000 feet, and Pan de Azúcar all seem to keep a stolid guardianship over the city.

The atmosphere is cold at this high altitude, and the ponds are covered with a thin crust of ice which the rising sun melts. Following the long narrow valley, many mountain streams are crossed, and the vegetation gradually changes from long grass to a shorter kind, while a sort of woolly lichen grows which is said to be good for cattle. A steep ascent is soon made to fifteen thousand four hundred and fifty feet, and though the air seems exhilarating, one cannot walk far without getting out of breath in consequence of the rarefied atmosphere. An occasional vicuña is to be seen here, but they are very shy, and it is difficult to shoot them. The rocks about are stratified layers of granite. Six and a half hours' ride brings the traveller to Picotani, where there is a farm of some twenty leagues in circumference, capable of supporting seventy thousand sheep. It never rains in this locality, for the air is so cold that the moisture is precipitated as snow. The rarefied air makes one feel the cold even more than the low temperature, while aside from the great loss of latent heat there is no fire to warm up by. Butter of fine quality is made in this region.

From Picotani the trail is through a rolling grass country, from where a splendid view may be had of the snow-clad tops of the Vilcañota range. Travelling parallel with these mountains and going due east, Rinconado, a small deep lake of rough water at the foot of Ananea, may be seen. At its southern end this lake is twelve hundred yards wide, narrowing at the north to four hundred yards. Here are peat bogs and a lot of ice-cold springs, while at the top of the hill is an old Spanish mountain town with a quartz mine at an altitude of over seventeen thousand feet, but too far above the line of perpetual snow to prove attractive for work. A stop is made at Poto, near by, where there is a plant for gold-washing. Leaving here in the morning and riding to the northwest, the crest of the Andes, at about sixteen thousand feet, is crossed, and the abrupt descent into the montaña begins. Down between dark snow-clad hills, in beating rain to Tambillo, the descent continues through a mountain path of slate forming a sort of stairway. The scenery is now of the grandest nature. The mountains rise precipitately on either side for thousands of feet, and

here and there are topped with snowy patches. A little stream which above was known as the Lata now changes its name to the River Sandia, and dashes on over a solid bed of slate, which is often stained black by organic matter. To look up against the face of the mountain it appears like a dead wall, and yet this precipitous place has been gradually circled in the descent, and far back the baggage mules may be seen slowly crawling along and appearing like so many diminutive insects as they wind around the narrow path. As the region of vegetation is reached the hillsides are terraced for grazing wherever available on account of the stony nature of the soil. Some of these terraces are only two or three feet wide. In some cases where there have been immense earth slides these also are terraced, and here the shepherds live while watching their flocks. Everywhere there are vari-colored and sweet-scented flowers. The wild pineapple—*wheenay-wheenay,* as the natives term it—is clinging to every rock, even without earth about its roots. The Indians hang up this plant to conjure away spirits.

As the descent, still precipitate, continues, the valley widens. The rocks are now crystalline and mica slate, with a few veins of quartz in places. At eleven thousand six hundred feet there are a few song birds, but no insects. Cuyu-Cuyu, at an elevation of about seven thousand feet, contains about three hundred houses of adobe and thatch, and there the Indian farmers raise vegetables, and huge cabbages are grown into veritable trees, like the palm, eight or ten feet high. The mountains about this little town are so high that the sun only reaches Cuyu-Cuyu after eight o'clock in the morning, and some parts of the valley are in shadow at a quarter past two in the afternoon. Leaving here the trail descends through a valley surrounded by high hills. At seven thousand feet the first cultivated orange trees are found, though there is not enough soil here for timber. Five leagues further on, the town of Sandia is reached, close to the heart of the Coca region. The Indians met with indicate this, as their hats are bound with sprays of Coca. The scenery here is picturesquely varied; from the surrounding heights there are magnificent cataracts, and for a thousand feet up the mountains there is a multiplicity of trees bearing peaches and other fruits, while myriads of flowering plants fill the air with sweet perfume and form a marked and delightful contrast to the previous bleakness.

In the northern part of Peru, between the cordilleras the tributaries of the Amazon form broad valleys having a tropical luxuriance, which is subdued by the modulation of the great altitude into a temperature of everlasting summer. The Marañon rises in a split of the first chain of the western cordilleras. At Bellavista, at an elevation of one thousand five hundred feet, the Marañon leaves the Andes. From here the

river flows on through the great Amazonian plain three thousand miles to the sea, having a fall of about six inches to the mile. The valley of the Marañon is two miles wide, the river varying from a volume of a hundred yards across to a network of channels half a mile in extent. In the rainy season the river rises five or six feet and floods the lowlands. Bellavista consists of a few shabby houses of adobe surrounding the public square, in which is the cathedral and principal shops. The lands here all belong to the municipality, and are worked in community on the old Incan order, being allotted to the people rent free, who in exchange are obliged to give their services to the public good in repairing roads or buildings, and acting as messengers. Some of the finest chocolate in the world comes from this region, and Coca of fine quality is grown. Wheat bread is too great a luxury for ordinary consumption here, and even the well-to-do use bananas as a substitute; indeed chocolate, bananas and Coca constitute about the only available food. Such fertile places afford an agreeable relief from the barren bleakness of the mountains, in fact to the Andean traveller there is always encouragement to struggle on to the realization of more delightful scenes beyond. In this respect the journey across the Andes, though severe and trying, so far excels the ascent of Aetna, Vesuvius, or the Matterhorn, made merely for the gratification of an idle curiosity, or simply to test the powers of endurance. In one case there is constant ascent into bleak and dreary regions, where one is obliged to sleep with the prospect of being frozen to death or precipitated into some icy crevasse for the mere hope of being enabled to see the early rising sun or to gaze into the depths of some sulphurous crater, while in the other there is the consciousness of bright and ever-blooming fields beyond, of verdant plains and fertile valleys, with a luxuriance of vegetation, which combine to amply repay for the arduous journey.

The grandeur of some of the Andean plains is unequaled elsewhere on the globe. Separating profound ravines filled with a wealth of verdure are lofty ridges, while beyond are long valleys, and surrounding all are snowy peaks backed by a sky of intense blue. In such a plateau and amidst such surroundings and advantages, at an altitude of 12,000 feet, is the beautiful valley of Vilcamayu, running northwest and southeast. Here was the site of foundation of the Incan empire—here is the city of Cuzco—and here were built the palaces of the Incas, and their terraced gardens and impregnable fortresses. In the neigboring hills may be seen vast flocks of sheep and alpacas, cropping the coarse *ychu* grass, while across the stillness comes a faint piping, which directs attention to a long train of llamas, slowly winding over the mountain bearing a cargo of Coca to the city of Cuzco. The air here,

though thin, is so pure, soft and exhilarating as to at once suggest that Nature has founded an ideal sanitarium for all the world. This fertile valley extends to the Vilcañota range, a chain connecting the eastern and central cordillera, which abruptly cuts off all verdure, for south to beyond Titicaca is the bleak region known as the *Collao,* where all is barren and desolate, through a section three hundred miles long by one hundred wide, where vegetation is about impossible and only occasional potato crops and scrawly quinoa and molle trees grow. It is always winter here, and the cattle find their scanty sustenance by feeding on the rushes of the lake, which serve many uses, from making ropes, sails and even balsas to supplying fodder. Looking east may be seen the lofty peaks of Illimani and Illampu, among the highest in South America, while amidst these barren surroundings is the historic Lake Titicaca, in the southern limit of the Peruvian Andes.

Lake Titicaca, which is situated in a basin 12,545 feet above the sea, between Peru and Bolivia, is irregular in form and almost cut in two by the Peninsula of Copacabana. It has never been accurately measured, but it is estimated to be upward of a hundred miles in length and about fifty miles broad at its widest part. Near the eastern side its water has a depth of over seven hundred feet, but the western shore slopes more shallow, affording growth for rushes, which make a home for numerous water fowl. Many rivers go to form this body of water, the largest being Ramiz, formed by the Pucara and Azangaro, entering the lake at its northwest border, while the Suchiz, formed by the Cavanilla and Lampa, flow in on the north side, together with Yllpa and Ylave. On the east are the Huarina, Escoma and Achacache, from a low chain parallel with the Eastern Andes, while the only outlet for this great volume of water is the Desaguadero, a river one hundred and seventy miles long, flowing with great rapidity from the southern end of the lake and emptying into Lake Aullagas or Poopó, beyond which the water is lost in a marshy swamp through which it possibly percolates to some cavernous depths below, and so on out to the Pacific. Lake Titicaca is often described as the most elevated body of water in the New World, but Lake Aricoma, the bed of which is said to be full of gold, and Lake Rinconado, both of which are fed from the glaciers of the neighboring mountains, have their outlets here and are at greater altitudes, only exceeded in height by those lofty lakes of Tibet, situated almost diametrically opposite on the globe.

Some forty miles from the southern end of the lake is a vast field of cyclopean ruins which are only to be reached by mule back over an ancient highway. There is no tradition to link these archaeological relics with the present people, or even with the Incas. Here are strewn

the remains of two large quadro-lateral buildings, monolithic towers and broken statues, all of which have been blocked out of vast masses of stone with geometrical precision, and often carved with symbolic ornamentation in relief. The material of these ruins is generally hard sandstone, or trachyte—a volcanic rock which is largely represented throughout the cordilleras, but which is not found in this particular locality. It is presumed that these immense blocks were conveyed here by people who had no others means of applying force than main strength, from a distance of at least twenty-five miles by water and fifteen miles by land. Here these masses were set up and fitted together with the greatest nicety, the joining of the blocks being by mortices accurately cut in the rocks.

One of the most remarkable of the ruins is a doorway carved from a single block seven feet high, thirteen and a half feet long, and about two feet thick. There is a fracture across the lintel, but the fragment, which has settled a little, has not fallen. Above the arch is a frieze sculptured in low relief. In the centre is a figure, the head surrounded by rays representing serpents, while on either side of this there are four rows of figures, very much resembling the jacks on playing cards. A similar design occurs so often among the ancient Peruvian relics found upon the coast as to suggest a common origin. There are forty-eight of these figures, each in a kneeling posture, facing toward the central figure. All are winged and hold sceptres terminating with condors' heads, while the figures of each alternate row have either crowned human heads or condors' heads. It is supposed this relic commemorates some homage to a deity or mighty sovereign, but of what people or in what epoch is not even conjectured.

These ruins are collectively spoken of as *Tiahuanaco*—a Quichua term, which tradition says originated through one of the Incan sovereigns having addressed a *chasqui*—or rapid messenger who had come to him here, *tia-huanaco*—"Be seated, O Huanaco!"—referring to the rapidity of his journey by comparing it with the swiftness of the *guanaco,* of the llama tribe. The style of the architecture and sculpture of the Tiahuanaco ruins is decidedly unique, and the exactness of squaring and joining the blocks is pronounced to be unsurpassed, even by the famous ancient works of the Old World. Many of the walls have been destroyed by treasure hunters, or to obtain material for building in the vicinity; but the early writers all agree in their description of the massiveness when intact. The valley is well populated by a people who represent the remains of the Incan race, and everywhere about may be seen the relics and ruins of the former empire. The Indians are industrious and delight in husbandry. They use a curious form of plough, sometimes made from the fork of a tree,

or again consisting of a spear-pointed implement which they term *rejka*. This is thrust into the ground by hand while women follow and break the clods with a club. Here are still met the couriers who carry the government despatches, just as was done in early Incan times. Supported solely by Coca, they are considered capable of running a hundred miles, a feat often repeated. They are a sturdy-looking lot of fellows, who appear to be a race by themselves.

About twenty-five miles from Cuzco the road leaves the river and climbs a steep hill, from which a level valley extends to the ancient capital, which is entered through the ruins of a gateway of an old Incan wall. Whatever Cuzco may have been during the time of the Incas, it is now a wretchedly filthy city. The churches, which are numerous, are built on the foundations of the old palaces, and everywhere the relics of Incan greatness have been employed to modern advantage. The once Temple of the Sun is now the Church of the Dominican Friars; the Temple of the Virgins is a convent, while many private dwellings are constructed of stone from the various ruins. In one of the richest chapels of Cuzco is a relic which was sent by Charles V—the crucifix of *Nuestro Señor de los Temblores*—"Our Lord of the Earthquakes," which the Indians regard with great veneration. To the north is the famous hill of Sacsahuaman,[70] the fortress of which dominated Cuzco and was pronounced by the conquerors, "The ninth wonder of the world." Whether this was of Incan structure archaeologists are not agreed. The works were defended by a line of walls eighteen hundred feet long, formed in three terraces, each supporting a parapet. The Spaniards reduced these walls, but their line may still be studied. Some of the stones forming the wall at its northeast angle were of Cyclopean size, weighing hundreds of tons. The stones were of every conceivable shape, but were cut and dressed with the greatest precision, laid without mortar, and fitted together with such exactness that a knife blade could not be thrust between them. The ruins of Ollantay at Urabamba, about a day's journey from Cuzco, are fully as wonderful as those of Sacsahuaman. The chief commerce of Cuzco, which is controlled by Germans, is in Coca leaves and other tropical produce of the valleys, and in the wools of the mountains.

As a higher elevation is reached the air becomes cold, and the snow-capped mountains in the distance are seen through the clear atmosphere that seems to bring them very near. As night approaches, an encampment is made in the open air, usually by preference, because of the numerous insects which infest every habitation. These are

70. *Sacsahuaman,* fill thee, falcon! implying the vultures would feast on those who attempted its assault.

particularly annoying to travellers, though the natives do not seem to mind them, and, in fact, the Indians often relish them. As one means of protection against the multiplicity of these pests, Nature has placed here a large, black bug, about an inch and a half long, heavy bodied, with an ant-like waist, and with transparent wings. The natives call it *amigo del hombre*—the "friend of man," on account of its killing and burying all poisonous insects. At times it may be absolutely necessary to take refuge in one of the *tambos,* or shelter houses, where protection may be found from the cold winds, now often filled with snow and hail. Here the traveller, wrapped in heavy woolens and fleecy poncho, supplemented by rugs or a sleeping bag of vicuña skins, may barely succeed in keeping himself warm by the physical exertion of shivering, while his Indians, scantily clad, squat together outside upon the frozen ground in some sheltered nook, where they apparently rest comfortably in a sweet slumber that is uninfluenced by the elements. The Indian squats on every occasion, rarely sitting on a chair. It is very much as Gilbert's song of the Admiral in *Pinafore* says: "This is his customary attitude," for he not only squats to sit, but he takes his sleep in this way, and even does much of his work in this same pose, while his dead body is buried in the same position. It is amusing to see the deliberation with which these people cut grain with a small sickle; they do this squatting, grasping a handful of grain it is carefully cut and carefully laid down. The Indian women squat in the market place when offering their wares for sale, while at their weaving they get still lower and lie prostrate. It has been suggested that this position is assumed as a means of keeping warm, but they never are known to display any annoyance from the cold, and are seemingly as oblivious to the elements as to the pangs of hunger, a relief they attribute to having propitiated the genii of the mountains through their constant use of Coca. At any rate, they are sustained by Coca in their travels, and it affords them not only *callpa*—or force, but warmth and comfort during the still hours of the coldest night in the high altitudes. And it is still here, so still that one may actually feel the awe of utter loneliness, a stillness which, in the reverberations of the slightest sound, lends a profundity to the echo.

Speaking of echoes suggests the weird and the ghostly. These Andeans are full of superstition, but amidst such crags and peaks in the darkness and stillness of the night, with only the occasional cry of some bird, it doesn't require an exalted imagination to think of spooks and hobgoblins. But it is not only at night that the Indian is full of dread, for there is a constant possibility that some enemy may cast a sort of *ojo*—or evil eye, upon him or upon his belongings, while, if he escape this terror, there is yet a dread that *chucaque*—another mysteri-

ous spell, may be thrust upon him. *Chucaque*, they say, is as though a man were made "to feel cheap," and as it is often manifest by severe cramp, it not unnaturally does make one feel humiliated. These conditions are only promptly to be relieved by some *curadera*, an old woman who understands the secret, when, by means of a poultice of mustard and tobacco, aided by certain cabalistic signs, the evil influence is driven out. Similar superstitious beliefs are entwined throughout all the customs of these people. The Indians live to a good old age on the mountains, a fact which has been set down to the long-continued use of Coca as a promoter of vigor and endurance. At any rate eighty, ninety and a hundred years is not at all uncommon here, even though life is commenced at so early an age that *mestizo* girls may be mothers at ten.

The Indians in the mountains have an intuitive knowledge of physical conditions. They can tell you with unerring accuracy in the morning, under a clear sky, just what hour of the day it will rain, and yet they seem to have no idea of time or distance. If you ask an Indian how far it is to a certain place he will reply: *"Mucha cuesta"*—"much up hill," or "just a little way." They measure their journeying as they do the extent of their labor, by the amount of Coca it is necessary to consume to reach a given place or perform a certain task.

HISTORY OF COCA

Coca has marked the downfall of one of the most profound examples of socialism ever recorded in history, and has outlived the forceful attacks of Church and State which were maliciously hurled against it as an example of idolatry and perniciousness. These attacks were the outgrowth of a shallowness of thought, intermingled with the prevalent prejudices of the several important epochs of its history. In the earliest literature concerning Peru we trace the beginning of this element of superstition toward Coca, for it was presumed there could be no good custom followed by the Indians. The entire aboriginal American race was regarded by the invaders as little more than savage devils worthy only of extermination. Thus Pedro Cieza de Leon, who wrote at the time of the Conquest, garnished his tales with pictures and stories of the Prince of Evil, with whom the Indian was inferred to be in close compact.

Cieza was a mere boy of fourteen when he embarked with Don Pedro de Heredia, in 1532, to seek fortune in the New World. When we consider that the conceptions of this writer were only such as might be inspired by the rough and rugged opportunities which camp life offered, it certainly seems remarkable that he had the foresight to compile so acceptable a journal of the early Peruvians. The seriousness with which he undertook this task, and his exactitude in recording current events, may be appreciated from his statement: "I noted with much care and diligence, in order that I might be able to write with that truth which is due from me and without any mixture of inaccuracies." [71]

Heredia founded the city of Cartagena, in the province of Tierra Firma, as Panama was originally termed, and after Cieza had spent five years of life there, he enlisted under Pedro Vadillo in a desperate exploit across the mountains of Abibe and through the valley of Cauca and Popayan. Subsequently we find this boy historian marching with Robbdo and then serving under Belalcazar, until, as the chronicler states, "he, too, became entombed in the bellies of the Indians"—for they were marching through a country of savages who were cannibals.

71. Cieza; p. 15; 1550.

Cieza was first intimately associated with Peruvian affairs in the campaign with Gasca, at the final rout of Gonzalo, and he afterward travelled under this first President of the Royal Audience through the interior of Peru. Having compiled an extensive notebook of the country and the doings of the times, which was to form a connecting link between the Incas and the Spanish invaders, he returned to Lima by way of the coast from Arequipa, from whence he sailed for Spain September 8, 1550. The events during seventeen years of travel he has recounted in his chronicles with remarkable minuteness.[72]

There was a prejudice and superstitious credulity among the Spanish conquerors for all the customs of the Incas. The bigotry of the time is well illustrated in a story told of Columbus. On the return from his first voyage he took with him to Spain several Indians, who were baptized at Barcelona, where one of them shortly afterward died, and Herrera, referring to this nearly three hundred years after, tells us this Indian "was the first native of the New World who ever went to Heaven," [73] though no intimation is made as to the probable destination of the millions of Americans who had preceded him. Amidst such prejudices, it is not surprising that the Coca plant so prized by the Indians was deemed by the Spanish unworthy of serious consideration, and that it was looked upon by them merely as a savage means of intoxication, or at best a mere source of idle indulgence among a race they so much despised.

Throughout his writings Cieza refers frequently to Coca, though he has not given any very concise botanical description of the plant, referring more particularly to its common use. In the first part of his chronicles of Peru, he says: "In all parts of the Indies through which I travelled I noticed the Indians delighted to carry herbs or roots in their mouths; in one province of one kind, in another another sort, etc. In the Districts of Quimbaya and Anzerma they cut small twigs from a young green tree, which they rub against their teeth without cessation. In most of the villages subject to the cities of Cali and Popayan they go about with small Coca leaves in their mouth, to which they apply a mixture which they carry in a calabash, made from a certain earth-like lime. Throughout Peru the Indians carry this Coca in their mouths; from morning until they lie down to sleep they never take it out. When I asked some of these Indians why they carried these leaves in their mouths, which they do not eat, but merely hold between their teeth, they replied that it prevents them from feeling hungry, and

72. Part First, published in 1550; Part Second, the *Relacion* of "Juan de Sarmiento"; Parts Four and Five are supposed to still be in manuscript at Madrid.

73. Markham; Cieza, *Introduction;* p. LVII; 1883.

gives them great vigor and strength. I believe that it has some such effect, although perhaps it is a custom only suitable for people like these Indians. They so use Coca in the forests of the Andes, from Guamanga to the town of La Plata. The trees are small, and they cultivate them with great care, that they may yield the leaf called Coca. They put the leaves in the sun, and afterwards pack them in little narrow bags containing a little more than an *arroba* each. This Coca was so highly valued in the years 1548, '49, '50 and '51 that there was not a root nor anything gathered from a tree, except spice, which was in such estimation. In those years they valued the *repartimientos* of Cuzco, La Paz and Plata at eighty thousand dollars, more or less, all arising from this Coca. Coca was taken to the mines of Potosi for sale, and the planting of the trees and picking of the leaves was carried on to such an extent that Coca is not now worth so much, but it will never cease to be valuable. There are some persons in Spain who are rich from the produce of this Coca, having traded with it, sold and resold it in the Indian markets." [74]

The Incas regarded Coca as a symbol of divinity, and originally its use was confined exclusively to the royal family. The sovereign could show no higher mark of esteem than to bestow a gift of this precious leaf upon those whom he wished to endow with an especial mark of his imperial favor. So when neighboring tribes who had been conquered by the Incas, acknowledged their subjection and allegiance, their chiefs were welcomed with the rank of nobles to this new alliance and accorded such honors and hospitalities as gifts of rich stuffs, women and bales of Coca might impress.

At the time of Mayta Ccapac—the fourth Inca, his queen was designated Mama Coca—"the mother of Coca," as the most sacred title which could be bestowed upon her. From so exalted a consideration of the plant by royal favor, it was but a natural sequence that the mass of the people should regard Coca as an object for adoration worthy to be deemed "divine."

Cristoval Molina, a priest at the hospital for the natives at Cuzco, from whose work [75] we have drawn our account of the rites and festivals of the Incas, has related the method of using Coca by the high priests in conducting sacrifices. Just as Cieza, with the material instinct of the soldier, saw only the physical or superstitious element in the use of Coca among the Indians, so this priest traced for us its spiritual association with the ceremonies of the people. Thus there was early interwoven the factors of a prejudice of superstition, a popular adora-

74. Cieza; p. 352; 1550.

75. Molina; 1570.

tion of the masses, and a blending of these with a religious regard for Coca, for the teachings of the Church were engrafted upon existing customs in order to hold the people.

The first scientific knowledge of Coca published in Europe was embodied in the writings of Nicolas Monardes,[76] a physician of Seville, in 1565, from material possibly gained from Cieza, though it would seem that he had intimately examined the Coca shrub. A translation of this work was made a few years later by Charles l'Ecluse [77]—a botanist and director of the Emperor's Garden at Vienna—which was published in Latin at Antwerp, and this is often quoted as the earliest botanical reference to Coca. The Kew Library possesses a translation of this book, "made into English" by John Frampton and printed in black letter with the curious title: *"Joyful News out of the Newe Founde Worlde, wherein is declared the Virtues of Hearbes, Treez, Oyales, Plantes and Stones."*

As showing the discernment in this botanical description of Coca made so many years ago, it may not be uninteresting to read a paragraph translated from the very language of Monardes:

"This plant Coca has been celebrated for many years among the Indians, and they sow and cultivate it with much care and industry, because they all apply it daily to their use and pleasure. * * * It is indeed of the height of two outstretched arms, its leaves somewhat like myrtle, but larger and more succulent and green (and they have, as it were, drawn in the middle of them another leaf of similar shape); its fruit collected together in a cluster, which, like myrtle fruit, becomes red when ripening and of the same size, and when quite ripe it is black in color. When the time of the harvest of the leaves arrives, they are collected in baskets with other things to make them dry, that they may be better preserved, and may be carried to other places."

This description will hold equally good to-day. The peculiar leaf within a leaf arrangement formed by the curved lines running on either side of the midrib, being a marked characteristic of Coca.

When Hernando Pizarro returned to the court of his king, with the first fruits of the golden harvest from the New World, he probably took with him specimens of Coca. This plant could not have failed to have awakened at least the curiosity of the invaders, because of the numerous golden duplications of the Coca shrub and of its leaf that had been found in the gardens of the Temples of the Sun, at Cuzco and elsewhere among the royal domains of the Incas. So that whatever the prejudices may have been regarding the use to which Coca was

76. Monardes; 1580.

77. Lat. Carolus Clusius; 1582.

put by the Indians, these golden images at least would prove sufficient to excite admiration and comment.

Another voluminous writer upon the early Peruvians is Joseph de Acosta, a Jesuit missionary who made a passage across the Atlantic in 1570, which he assures us:—"would have been more rapid if the mariners had made more sail." After his arrival at Lima he crossed the Andes by the lofty pass of Pariacaca to join the Viceroy Toledo, with whom he visited every province. In the higher altitudes of the mountains the party suffered severely from the effects of the rarefied atmosphere, with which he was afterwards prostrated upon three successive occasions, while he also was severely annoyed from snow blindness, for which he relates a homely remedy offered him by an Indian woman, who gave him a piece of the flesh of the vicuña, saying, "Father, lay this to thine eyes, and thou shalt be cured." He says: "It was newly killed and bloody, yet I used the medicine, and presently the pain ceased, and soon after went quite away."

Father Acosta was a man of great learning, an intelligent observer, and had exceptional opportunities for collecting his information. His work on the Natural History of the Indies ranks among the higher authorities. He has given a very extensive description of Coca, and, referring to its employment, says: "They bring it commonly from the valleys of the Andes, where there is an extreme heat and where it rains continually the most part of the year, wherein the Indians endure much labor and pain to entertain it, and often many die. For that they go from the Sierra and colde places to till and gather them in the valleys; and therefore there has been great question and diversity of opinion among learned men whether it were more expedient to pull up these trees or let them grow, but in the end they remained. The Indians esteemed it much, and in the time of the Incas it was not lawful for any of the common people to use this Coca without license from the Governor. . . . They say it gives them great courage, and is very pleasing unto them. Many grave men hold this as a superstition and a mere imagination. For my part, and to speak the truth, I persuade not myself that it is an imagination, but contrawise I think it works and gives force and courage to the Indians, for we see the effects which cannot be attributed to imagination, so as to go some days without meat, but only a handful of Coca, and other like effects. The sauce wherewith they do eat this Coca is proper enough, whereof I have tasted, and it is like the taste of leather. The Indians mingle it with the ashes of bones, burnt and beat into powder, or with lime, as others affirm, which seemeth to them pleasing and of good taste, and they say it doeth them much good. They willingly imploy their money therein and use it as money; yet all these things were not inconvenient, were

not the hazard of the trafficke thereof, wherein so many men are occupied. The Lords Yncas used Coca as a delicate and royall thing, which they offered most in their sacrifice, burning it in honor of their idols." Again, when speaking of the importance of the trade in Coca, he says: "It seems almost fabulous, but in truth the trafficke of Coca in Potosi doth yearly amount to above half a million of dollars: for that they use four score and ten or four score and fifteen thousand baskets every year." [78]

This extensive mining centre in the southern part of Bolivia is some three hundred miles south of Sandia, which is to-day the very heart of the Coca region of Caravaya. These mines were at an altitude of seventeen thousand feet, and Garcilasso says the Indians applied the term Potosi, literally a hill, to all hills. In the Aymara tongue Potosi means, "he who makes a noise," and the Indians have a legend which suggests the derivation of the name from such a source. When Huayna Ccapac caused his people to search this mountain for silver, a great noise came from the hills warning the Indians away, as the protecting genius destined these riches for other masters. Within a short time after the Incas had discovered silver here over seven thousand Indians were at work mining the precious ore.

The Spaniards were not slow to recognize this vast store of treasure, and in their haste to accumulate the wealth which they had come so far to secure they forced the Indians to labor in veritable slavery through an enactment which drafted a certain number from each of the adjoining provinces. This law, known as the *mitta,* instituted under Toledo, required all Indians between the ages of eighteen and fifty to contribute a certain labor, which amounted to eighteen months during the thirty-two years in which they were liable. For this they were paid twenty reals a week, and a half real additional for every league distant from the village of Potosi. During the year 1573 the draft of Indians for this labor amounted to 11,199, while a hundred years later—in 1673—it drew only 1,674, showing that cruelty and hardship had depopulated the province nearly ninety per cent.

So extensive were the mining operations at Potosi that the place had the appearance of a great city. Every Saturday the silver was melted down and the royal fifth was set aside for the Spanish crown, and although this amounted during the years 1548 to 1551 to three million ducats, it was considered the mines were not well worked. In those times the markets or fairs were important functions, and that of Potosi was looked upon as the greatest in the world. It was held in the plains near the town, and there the transactions in one day were said to

78. Acosta; Book I, p. 245; 1590.

amount to from twenty-five to thirty thousand golden pesos, Coca being a prominent commodity in the reckoning, owing to its absolute necessity in the arduous work exacted from the Indians.

Because of this need the highest price was obtained for Coca in this region, where every indication was presented for its use—the extreme altitude of the mines, the mental dejection of slavery, and the enforced muscular task of the Indian with insufficient food. This labor was found to be utterly impossible without the use of Coca, so that the Indians were supplied with the leaves by their masters, just as so much fuel might be fed to an engine in order to produce a given amount of work. Garcilasso tells us that in 1548 the workers in these mines consumed 100,000 *cestas* of Coca, which were valued at 500,000 piasters.

This absolute necessity was the sole reason for the Spanish tolerance to the continuance of Coca; they saw that it was indirectly to them a source of wealth, through enabling the Indians to do more work in the mines. As the demands of labor increased the call for Coca, situations for new cocals, where a supply of the plant could be raised to meet this want, were pushed further to the east of the Andes, in the region of the montaña. To make favorable clearings numerous tribes of savage Indians, who had not been previously subdued by the Incas, were driven from the Peruvian tributaries of the Amazon further into the forests.

Agustin de Zarate, who was *contador real,* or royal comptroller, under the first Viceroy, Blasco Nuñez Vela, in his history of the discoveries of Peru, in writing of Coca, says: "In certain valleys, among the mountains, the heat is marvellous, and there groweth a certain herb called Coca, which the Indians do esteem more than gold or silver; the leaves thereof are like unto Zamake (sumach); the virtue of this herb, found by experience, is that any man having these leaves in his mouth hath never hunger nor thirst." [79]

Garcilasso Inca de la Vega—as he delighted in terming himself—has very rightly been classed as an eminent authority on Incan subjects. His father, who was of proud Spanish ancestry, illustrious both in arms and literature, came to Peru shortly after the Conquest, served under Pizarro, and after the overthrow of the empire, when the Incan maidens were assigned to various Spanish officers, his choice fell upon the niece of Inca Huayna Ccapac, who in some manner had been preserved from the massacre which had followed upon the death of her cousin, Atahualpa. It seems fitting that a son of such parentage should embody in his writings facts which he had obtained from both branches

79. Zarate; 1555.

of the family tree, and because of this his work is accepted as a reliable presentation.

That this Incan author was well qualified to speak upon Coca there can be no doubt, for he owned an extensive cocal on the River Tunu, one of the tributaries of the Beni—which drains the montaña for Paucartambo—where there are still numerous cocals. This plantation was started in the twelfth century during the reign of Inca Rocca, when that king sent his son with fifteen thousand warriors to conquer the savage tribes of Anti-suyu.

Lloque Yupanqui advanced to the River Paucartambo and thence to Pillcu-pata, where four villages were founded, and from Pillen-pata he marched to Havisca, and here in the year 1197 was located the first Coca plantation of the montaña on the eastern base of the Andes.[80] This Incan plantation became an inheritance of Garcilasso from his father, but was forfeited by the historian because of his parent's early defection to the cause of Gonzalo.

The work of Garcilasso is interesting as embracing with the relation of others that of Father Blas Valera, whose manuscripts have since been lost, and in this embodied record we have the only available account of one who was a close observer of Incan customs during a residence of many years in Peru. To the peculiar wording of the work of this author we may trace an oft-repeated error regarding the Coca shrub, which he describes as "a bush of the height and thickness of the vine."[81] Whether this designation of vine refers to the grape, which in some vineyards is grown as a low clump resembling a bush, or whether the term vine simply alludes to the delicate nature of the Coca shrub, can only be inferred. It has introduced a source of inaccuracy among some who have since drawn their description of the plant from this record. One author has even amplified this early comparison by saying that the Coca bush twines about other plants for support.[82]

Valera, in describing the leaves of Coca, says: "They are known by Indians and Spaniards alike as *Cuca*, delicate, though not soft, of the width of the thumb and as long as half a thumb's length, and of a pleasant smell." In his day the Indians were so fond of Coca that they preferred it to gold, silver and precious stones. He has given us a careful account of the diligence which is necessary in the several stages of its cultivation and the importance of the final gathering of the leaves,

80. Garcilasso; Vol. I, p. 330; 1872.

81. Valera; in Garcilasso; 1609.

82. Ulloa; p. 488; 1772.

which he says, "they pick one by one by hand and dry them in the sun." He, however, wrongly viewed the method of use, and supposed that the leaves were merely chewed for their flavor and that the juice was not swallowed.

Referring to the general employment of Coca for a variety of purposes, he says: "*Cuca* preserves the body from many infirmities, and our doctors use it pounded for applications to sores and broken bones, to remove cold from the body or to prevent it from entering, as well as to cure sores that are full of maggots. It is so beneficial and has such singular virtue in the cure of outward sores, it will surely have even more virtue and efficacy in the entrails of those who eat it!" Nor did this observant author fail to recognize another important use in which this famous plant was practically serviceable. A tax of one-tenth of the Coca crop was set apart for the clergy, of which he says: "The greater part of the revenue of the bishops and canons of the cathedrals of Cuzco is derived from the tithes of the *Coca* leaves."

There is a marked contrast between the open, conscientious manner of Valera's writings with that of other Spanish authors, who displayed an abhorrence for all the customs of the Indians. Thus Cieza, reflecting this superstitious prejudice, tells us that the old men of every tribe actually conversed with the arch-enemy of mankind. Referring to the Incan rite of burying bags of Coca with their dead, as a symbol of support for the departed in a journey to the eternal home, he mockingly says, "as if hell was so very far off." The good *padre,* in his appeal for the continuance of Coca, has shown a liberality for such a period of bigotry which might be well for the consideration of others in even this more enlightened age. Thus he writes:

"They have said and written many things against the little plant, with no other reason than that the Gentiles in ancient times, and now some wizards and diviners, offer *Cuca* to the idols, on which ground these people say that its use ought to be entirely prohibited. Certainly this would be good counsel if the Indians offered up this and nothing else to the devil, but seeing that the ancient idolators and modern wizards also sacrifice maize, vegetables and fruits, whether growing above or under ground, as well as their beverage, cold water, wool, clothes, sheep and many other things, and as they cannot all be prohibited, neither should the *Cuca*. They ought to be taught to abhor superstitions and to serve truly one God, using all these things after a Christian fashion." Surely, an impartial judgment, which is worthy of present acceptation.[83]

Garcilasso has added to this account some further particulars made

83. Valera; in Garcilasso; Vol. II, pp. 371–375; 1871.

familiar to him through his intimate acquaintance with the cultivation and care of Coca. In his quaint verbiage, which has possibly suffered through translation, he says of the shrubs: "They are about the height of a man, and in planting them they put the seeds into nurseries, in the same way as in garden stuffs, but drilling a hole as for vines. They layer the plants as with a vine. They take the greatest care that no roots, not even the smallest, be doubled, for this is sufficient to make the plant dry up. When they gather the leaves they take each branch within the fingers of the hand, and pick the leaves until they come to the final sprout, which they do not touch, lest it should cause the branch to wither. The leaf, both on the upper and under side, in shape and greenness, is neither more nor less than that of the arbutus, except that three or four leaves of the *Cuca,* being very delicate, would make one of arbutus in thickness. I rejoice to be able to find things in Spain which are appropriate for comparison with those of that country—that both here and there people may know one by another. After the leaves are gathered they put them in the sun to dry. For they lose their green color, which is much prized, and break up into powder, being so very delicate, if they are exposed to damp, in the *cestas* or baskets in which they are carried from one place to another. The baskets are made of split canes, of which there are many of all sizes in these provinces of the *Antis.* They cover the outside of the baskets with the leaves of the large cane, which are more than a *tercia* wide and about half a *vara* long,[84] in order to preserve the *Cuca* from wet, for the leaves are much injured by damp. The basket is then enveloped by an outer net made of a certain fibre."

Referring to the extreme care essential for its preservation, this Incan author concludes: "In considering the number of things that are required for the production of *Cuca,* it would be more profitable to return thanks to God for providing all things in the places where they are necessary than to write concerning them, for the account must seem incredible."

It may be recalled that at the time of Huayna Ccapac's death the kingdom, which now extended over such immense territory, was for the first time divided under two rulers, one-half being given to his son, Huasca, and the other half to his son Atahualpa. It therefore seems quite probable that as the interests of the government extended northward the customs of the people of the lower Andes should follow, and be propagated among a people where similar conditions called for whatever beneficial influence might be derived from the use of Coca. From Quito travel northward, aided by the canoe navigation of

84. A *vara* is thirty-three English inches.

the Cauca and Magdalena rivers, would rapidly carry the customs of the people of the south to the northern coast, where, as shown by early historical facts, commerce was so extensive as to favor the adoption of the habits of the interior.

There are still many tribes along the Sierra Nevada of Santa Marta [85] who have preserved their ancient customs and habits from prehistoric times, for it is known that the Spanish were never able to completely attain possession of this region. It has been suggested that these Indians had never been subject to a king as were the Incas, while their country was so extremely fertile that when pursued by the Spanish they merely destroyed their homes and took up habitations elsewhere, depending upon a bountiful tropical vegetation for their support. In marked contrast to the Indians of New Grenada, the Peruvians were accustomed to subjection under their Lord Inca, and at the time of the Conquest they were obliged to submit themselves to their new masters, for if they abandoned their homes and lands which they had cultivated to flee to the barren mountains or snowy plains they must also give up their means for subsistence. Piedrahita speaks of the use of Coca along the northern coast and says that the leaves were chewed by the Indians without lime, an addition which he suggests was carried from the Incan domains to the northern Indians by the Spaniards after the Conquest.[86]

The expedition of the French mathematician, La Condamine, which went to Quito in 1735 to measure an arc of the meridian in the neighborhood of the equator, and thus verify the shape of the earth, was made memorable through a host of important scientific discoveries, primary among which was the introduction of many new plants into Europe; among these was caoutchouc or india rubber. Accompanying this expedition was Antonio d'Ulloa, a Spanish naval officer; Godin, Bouguer and the botanist, Joseph de Jussieu, whose name is associated with the classification of Coca. Condamine was the first man of science who examined and described the *quinquina* tree of Loxa, of which Linnaeus in 1742 established the genus *Cinchona*.

Jussieu travelled on foot as far as the forests of Santa Cruz de la Sierra, collecting botanical specimens from the richness of the Peruvian flora. Many of his exploratory trips were hazardous in the extreme, and in 1749, while crossing the Andes to reach the Coca region of the Yungas of Coroico, he nearly lost his life. Added to the dangers of

85. The use of coca by one of these tribes, the *Kogi*, is described in chapter 1, *The Role of Coca in the History, Religion and Medicine of South American Indians* by Richard T. Martin.—Eds.

86. Piedrahita; 1688.

the route the glistening brilliancy of the sun reflected from the snow seemed to threaten him with blindness.

Jussieu sent specimens of the Coca shrub to Paris, and these, examined and described by the explorer's brother Antoine, were afterward preserved in the herbarium of the Museum of Natural History there, and have served as classic examples of many subsequent studies of the plant. But the glory of meritorious labor pursued through great trial and privation was not to be enjoyed by this explorer. Just as many another collector before and since his time has suffered the loss of treasures when work was about completed, so this intrepid botanist lost the choice gatherings of fifteen years through robbery, under the belief that his boxes contained a more merchantable wealth than plants. In 1771, after an absence of thirty-four years, Jussieu was taken home, bereft of reason, as a result not alone of hardships, but from that unfulfilled desire which makes the soul sick, and he died in France, leaving many manuscripts, which are still unpublished.

The Jussieus were a family of botanists for several generations; contemporary with them were several noted naturalists who followed their classification. Among these, Augustin Pyrame Candolle, of the College of France, and Antonio Jose Cavanilles, a Spanish ecclesiastic, each described Coca from the examples which had been sent by Joseph.

Many interesting accounts have been written of the expedition of La Condamine,[87] and as a result of these early researches several of the powers have been prompted to send botanical expeditions to the South American forests. Among these there is given in the writings of Captain Don Antonio d'Ulloa a brief account of the country of Popayan, in the jurisdiction of Timana. While following Father Valera's description of Coca, he adds: "It grows on a weak stem, which for support twists itself around another stronger vegetable like a vine. . . . The use the Indians make of it is for chewing, mixing it with chalk or whitish earth called *mambi*.[88] They put into their mouths a few Coca leaves and a suitable portion of *mambi*, and chewing these together, at first spit out the saliva which that mastication causes, but afterwards swallow it, and thus move it from one side of the mouth to the other till its substance be quite derived, then it is thrown away, but immediately replaced by fresh leaves."

He confounds Coca with betel, saying: "It is exactly the same as the betel of the East Indies. The plant, the leaf, the manner of using it, its qualities, are all the same, and the eastern nations are no less fond

87. Condamine; 1745.

88. Spelled *manbi* by Delano; 1817.

of this betel than the Indians of Peru and Popayan are of their Coca; but in other parts of the province of Quito, as it is not produced, so neither is it used." But he was conscious of the physiological effects of Coca from its employment, and wrote: "This herb is so nutritious and invigorating that the Indians labor whole days without anything else, and on the want of it they find a decay in their strength. They also add that it preserves the teeth sound and fortifies the stomach." [89]

The early writings upon Coca were not, however, all of foreign authorship. Peru numbered among her men of letters a noted physician and statesman who drew his facts from a keen observation of the people of whom he wrote. I refer to Dr. Don Hipolito Unanue, of Tacna, whose name is intimately linked with the political and educational history of Peru. He published the *Mercurio Peruano,* the first number of which appeared in January, 1791, a paper which gave an impetus to the writings of his countrymen, in which there are many interesting details of Peruvian customs.

From his political interests in a land where insurrection was a common occurrence, Dr. Unanue could appreciate the advantage possible from the use of Coca in the army. He tells an incident of the siege of La Paz, in 1771, when the inhabitants, after a blockade of several months, during a severe winter, ran short of provisions and were compelled to depend wholly upon Coca, of which happily there was a stock in the city. This apparently scanty sustenance was sufficient to banish hunger and to support fatigue, while enabling the soldiers to bear the intense cold. During the same war a body of patriot infantry, obliged to travel one of the coldest plateaus of Bolivia, found itself deprived of provisions while advancing in forced marches to regain the division. On their arrival only those soldiers were in condition to fight who had from childhood been accustomed to always carry with them a pouch of Coca.[90]

That early prejudice is difficult to eradicate, is shown in the writings of some who, having given the facts of the use of Coca, then seem to apologetically qualify their reference to its support as a mere delusion. Thus Dr. Barham, writing of Coca in 1795, says: "This herb is famous in the history of Peru, the Indians fancying it adds much to their strength. Others affirm that they use it for charms. Fishermen also put some of this herb to their hook when they can take no fish, and they are said to have better success therefor. In short, they apply it to so many uses, most of them bad, that the Spaniards prohibit the use of it, for they believe it hath none of these effects,

89. Ulloa; Pinkerton; Vol. XIV, p. 448; 1813.

90. Unanue; 1794.

but attribute what is done to the compact the Indians have with the devil." [91]

But if there was prejudice on the part of the Spanish against native customs, the Indians resorted in kind with an equal antipathy against all Spanish innovations. This has been exhibited in the strong objection which the Indians have made to using cinchona bark. Humboldt, who forms the connecting link between the eighteenth and nineteenth centuries in our history of Coca, has referred to this, as have several other observers. It is quite probable, however, that this was a pretended prejudice openly expressed, while secretly the Indians acknowledged the benefits of the bark, which the story of its introduction relates as having been presented to the Countess of Chinchon by a descendant of the Incas.[92]

Humboldt travelled extensively through the province of Popayan in 1801. In describing the use of Coca among the early inhabitants he asserted that several species of *Erythroxylon* were in use, chiefly *E. Hondense*. His conception of the benefit of Coca, however, was confined to a belief that it was the lime rather than the leaf which formed the element of sustenance. Since his time so many travellers directed attention to the fact that the Indians were supported by some mysterious principle, that European investigators began to question whether this was really due to the Coca leaf or some secret admixture. The popular interest at the time was well set forth by an English writer, who appreciating the importance to be expected to a modern civilization from the introduction of the method of the Andean, said: "While not yet fully acquainted with the secret with which the Indians sustain power, it is certain they have that secret and put it in practice. They masticate Coca and undergo the greatest fatigue without any injury to health or bodily vigor. They want neither butcher nor baker, nor brewer, nor distiller, nor fuel, nor culinary utensils . . . there are thousands even in this happy land who will pour their blessings upon him if he will but discover a temporary anti-famine, or substitute for food, free from all inconvenience of weight, bulk and expense, and by which any person might be enabled, like the Peruvian Indian, to live and labor in health and spirits for a month now and then without eating. It would be the greatest achievement—whatever a London alderman might think—ever attained by human wisdom." [93]

In the early days when the traveller crossed the Andes in the region of Popayan, he was carried in a chair on the back of an Indian. The

91. Barham; 1795.

92. Markham; 1874.

93. *Gentleman's Magazine;* Vol. 84, p. 217, *et seq.;* 1814.

roads, then dangerous at all times, became practically impassable in unsettled weather; and the journey of twenty leagues from Popayan to La Plata on the Magdalena River occupied twenty to twenty-two days. The conditions were such as to call forth all reserve of endurance, and not only the Indian, but the traveller found relief and support during severe trials from the use of Coca. Bonnycastle, a captain of royal engineers, in referring to the use of Coca by the natives in these journeys, confounds it with betel, following the earlier error of Ulloa.[94]

The wonderful endurance of the guides and mail carriers travelling through passes of the Cordilleras where a mule could not go, has been frequent topic for comment by many writers, and though so often repeated is still wonderful. Stevenson, who was for twenty years in Peru, during which period he held many political appointments under the captain-general of Quito, in describing the customs of the people, refers to the runners, or *chasquis,* carrying letters from Lima, a distance of upward of a hundred leagues, without any other provision than Coca, just as did their predecessors centuries before in the time of the Incas.[95]

The attention of the English people was particularly directed to this sustenance of the Andeans by the fact that one of their countrymen, who became a prominent participant in the Peruvian war of independence, boldly announced his belief in the support which his troops derived from the chewing of Coca. General Miller not only employed Coca in his army during the campaign of 1824, but so freely acknowledged the benefit he derived from its use that he established a warm sympathy with the natives, and it became desirable for an Englishman travelling through the interior to announce himself as a countryman of Miller, when he was sure to receive:—"the best house and the best fare that an Indian village could afford." [96]

The frequent occurrence of similar allusions in the writings of South American travellers to the sustaining influence of Coca emphasized by repetition the importance of this property, while happily the developments of time have removed the stigma of a fabulous or superstitious element from its use.

Among the eminent scientists who wrote of Coca during the next decade were Poeppig, Tschudi, Martius and Weddell. Eduard Poeppig was a German naturalist who travelled in Peru and Chile between the years 1827 and 1832. Poeppig was not an enthusiastic admirer of Indian customs, and endeavored to associate some pernicious after

94. Bonnycastle; Vol. I, p. 276, *et seq.;* 1818.

95. Stevenson; 1825.

96. Miller; Vol. II, p. 198, *et seq.;* 1828.

effect with the sustaining power of Coca, which he considered comparable with opium. In referring to this statement Dr. Weddell—a more careful observer, held that while possibly there had been some abuse in the intemperate use of Coca by Europeans, there was in no instance the injurious results which had been asserted. He believed, as many of the Indians had assured him, that Poeppig had been led into error through generalizing exceptional occurrences.

Perhaps the Swiss naturalist, Von Tschudi, who visited South America in 1838, has been more frequently quoted in a popular way regarding Coca, than any other Peruvian traveller. Throughout his writings he testifies enthusiastically and forcibly for Coca, not only as employed among the natives, but from personal benefit in sustaining respiration when ascending to high altitudes. He tells of an Indian sixty-two years old who labored for him five days and nights without food and with but two hours' sleep each night, yet was still in condition to accompany him over a journey of twenty-three leagues, through which he jogged along afoot as rapidly as the mule carried his master, though depending wholly upon Coca for his sustenance. A similar experience has been reported by many travellers, for this custom is still practiced by the Indian guides.

Von Tschudi concluded that Coca is nutritious in the highest degree. "Setting aside all extravagant and visionary notions on the subject, I am clearly of the opinion that moderate use of Coca is not merely innocuous, but that it may even be very conducive to health. In support of this conclusion, I may refer to numerous examples of longevity among Indians, who, almost from the age of boyhood, have been in the habit of masticating Coca three times a day, and who in the course of their lives have consumed no less than two thousand seven hundred pounds if at the age of one hundred and thirty, and they commenced masticating at ten years—one ounce a day, yet nevertheless enjoy perfect health." [97]

This testimony is repeatedly added to by observers in various sections of South America. Martius, in describing Coca as used throughout western Brazil, under the name of *ypadu*, or *ipadú*, called attention to the wonderful effect which the powder of the dried leaves has upon the nervous system, especially on the brain, and recommended the adoption of Coca among the treasures of materia medica.[98]

Many theories have been advanced, to explain the ability of the Indian to endure through long journeys and hard labor, without other support than is afforded through chewing Coca. It has been

97. Tschudi; 1839.

98. Martius; 1840.

suggested that this hardihood and abstinence is due to habit and to vigorous development. But on the contrary the Indian is muscularly weak, and while training and habit may have much to do with his fortitude, he constantly requires the physical support afforded by Coca. Dr. Valdez, in writing of the use of Coca—or *"folha sagrada,"* as he terms it, has emphasized this: "The Indian is naturally very voracious, and loses his strength when abstaining from the leaves. With a handful of roasted corn and only Coca an Indian will travel a hundred miles afoot, keeping pace with a horse or mule." [99]

The researches of Dr. Weddell, a French botanist who went to South America with the scientific expedition of Count de Castelnau, sent out by Louis Philippe in 1845, not only confirmed, but harmonized the writings of those who had previously described the sustenance from this leaf. Though his researches were chiefly directed to the study of cinchona, his travels necessarily took him through the Coca regions. He visited the forests of Caravaya and Sandia, and the valley of Santa Ana, near Cuzco, all prolific Coca districts, where he had favorable opportunity for carefully examining the method of raising and preparing the leaf for the market. The commendations and carefully written details of this scientist gave a marked and added interest abroad to the economic use of Coca.[100]

These facts of travellers and naturalists have been elaborated by the historians, and Prescott, in his story of the *Conquest of Peru,* and Helps, in the *Spanish Conquest in America,* have embodied the salient points regarding the efficacy of Coca, or *Erythroxylum Peruvianum,* as the former as well as Miller terms it. Mr. Prescott had voluminous manuscripts at his disposal in the compilation of his famous work, with ample opportunity to verify statements. He particularly alludes to the assertion of Poeppig as to the injurious influence of Coca, of which he says: "Strange that such baneful properties should not be the subject of more frequent comment by other writers! I do not remember to have seen them even adverted to." [101]

Though many expeditions had been made through Peru in behalf of other powers, it was not until 1854 that the United States government sent an exploratory expedition under Lieutenants Gibbon and Herndon in search of the source of the Amazon. Many facts pertaining to the customs of the Indians, and the use of Coca in the districts these officials travelled, are embodied in their entertaining narrative report to Congress. Herndon, while in the valley of Chinchao, where

99. Valdez; 1844.

100. Weddell; 1853.

101. Prescott; *Note;* Vol. I, p. 143; 1848.

the cultivation of Coca commences in the northern montaña—between the central and eastern Cordilleras—mentions a visit to Señor Martius at his *hacienda* of Cucheros. The Señor told him this *quebrada* produced seven hundred *cargas,* or mule loads of two hundred and sixty pounds each, yearly. The value of such a crop at Huanuco, estimated at three dollars the *arroba* of twenty-five pounds, would make the gross yield $21,840, which, requiring seven hundred mules for transportation at the rate of $4 apiece, would reduce the earnings to about $19,000, though many of the small farms in the neighborhood then sold their Coca on the spot for two dollars the *arroba.*[102]

At Tarma the expedition separated, Herndon to follow the head waters of the Amazon, while Gibbon was to seek the source of the Madre de Dios—or, as it is termed in Quichua, *Amaru Mayu,* or snake river—and explore the Bolivian tributaries. The route led Gibbon to Cuzco, where he had opportunity to observe the industry about the royal city among cocals which had been plantations ever since the time of the Incas. As a rule Coca is grown in a small way by farmers who till their own land, but in a frontier settlement was seen a cocal which gave employment to a hundred laborers.[103]

There is a legend of the naming of the southern tributary of the Amazon by Padre Revello. The savage Chunchos, who are much feared in this region, at one time made a raid upon a neighboring settlement, killed the Christianized Indians, and destroyed their little church, throwing the sacred images into the stream. These were carried to the *Amaru Mayu,* where they rested upon a rock and afforded a suggestive hint for christening these waters, "Madre de Dios," by which name they have since been known. The most inveterate *coqueros* consider the Coca grown on the tributaries of the Madre de Dios, in Peru, to be superior to that produced along the waters of the Beni, in Bolivia. These two streams have their origin near to each other, between the gold washings of Tipuani and Caravaya, but a separating ridge of mountains causes the Madre de Dios to flow directly into the Amazon, while the Beni goes to the Madeira River.

The markets of La Paz are well supplied with fruits and vegetables from *Yungas*[104] on the Beni, and at one time nearly five hundred thousand baskets of Coca of seventy pounds each were annually produced there.

Of the wages paid to Coca cultivators who are unfortunate enough

102. Herndon and Gibbon; Vol. I, p. 129, *et seq.;* 1853.

103. Herndon and Gibbon; Vol. II, pp. 46–47; 1854.

104. Yuncu in Quichua implies a tropical valley, and Yungas is its Spanish corruption.

to be compelled to farm for others, it is related that the superintendent of a cocal below the valley of Cochabamba in Bolivia, received his shelter, scant cotton clothing, and fifteen dollars a year, a pittance sadly reduced by tithes to the Church.[105] Yet this man was not happy! He longed for the gay days in his native town of Socaba, where he might indulge in an occasional cup of *chicha* instead of impersonating "the man with the hoe" all day long in the Coca patch.

An epoch in the introduction of Coca to the medical men of Europe was marked by the *prize essay* of Dr. Paolo Mantegazza, published at Milan on his return after a residence in Peru, where he had been engaged in practice. He refers to the employment of Coca not only as a medicine but also as an article of food, a use not confined to the rich, like luxuries usually, but which, on the contrary, is prevalent among the working Indians, who enjoy Coca as a nutriment and restorative. So that a laborer in contracting for work bargains not only for the money which he shall receive but the amount of Coca which shall be furnished him.

"The child and the feeble old man seize with eagerness the leaves of the wonderful herb, and find in it indemnification for all sufferings and misery." [106]

Contemporary with these writings was the labor of Mr. Clements Markham, who visited Peru in 1859, for the purpose of collecting specimens of cinchona to establish its cultivation in India. This gentleman is a scholar of South American literature, and has rendered available to English readers the knowledge of the doings of the Spanish conquerors through translations of their early writings. His intimate study of Incan customs and the affairs of modern Peru, enables authoritative statements.

Of Coca he says: "Its properties are to enable a greater amount of fatigue to be borne with less nourishment, and to prevent the occurrence of difficulty in respiration in ascending steep mountain sides. Tea made from the leaves has much the taste of green tea, and if taken at night is much more effective in keeping people awake. Applied externally, Coca moderates the rheumatic pains caused by cold, and cures headaches. When used to excess, it is like everything else, prejudicial to the health, yet of all the narcotics used by man Coca is the least injurious and the most soothing and invigorating. I chewed Coca, not constantly, but frequently, from the day of my departure from Sandia, and besides the agreeable soothing feeling it produced, I found that I could endure long abstinence from food with less in-

105. Herndon and Gibbon; Vol. II, p. 185; 1854.

106. Mantegazza; 1859.

convenience than I should otherwise have felt, and it enabled me to ascend precipitous mountain sides with a feeling of lightness and elasticity and without losing breath. This latter quality ought to recommend its use to members of the Alpine Club, and to walking tourists in general. To the Peruvian Indian Coca is a solace which is easily procured, which affords great enjoyment and which has a most beneficial effect. The shepherd watching his flock has no other nourishment." [107]

But just as the mass of Peruvian manuscript in Spanish and native Quichua was of little utility to the working world until rendered so by the practical hand of the translator, so the wonderful qualities of Coca remained locked as a scientific mystery unsolvable by the multitude, until it was finally released from its enchanted spell as through some magic touch of a modern Merlin.

It has been said that a man is created for some especial work, and this seems happily applied in the present instance. Angelo Mariani was born in Bastia, the largest city of Corsica, where a foundation for scientific training through an ancestry of physicians and chemists preceded him. But better than ancestry is the work that a man does which shall live after him. Reared in an atmosphere where chemical possibilities were daily thoughts—while united with these was a love for books, and allied art and antiquities—it seemed but natural that he should experiment on the then much talked of Coca of the Incas, an ideal of endurance, interest in which the tales of travellers and scientists from Cieza to Mantegazza had only intensified. The problem of the elixir of life, so baffling to philosophers since long before the days of Hermes Trismegistus, which many now believed was pent up in Coca—seemed capable of as definite solution as is possible through human intervention. Commencing investigation with the unmistakable evidence regarding the properties of Coca, it was sought to present these in a positive and available form, which fluid and solid extracts, or the volatile herb, had not uniformly preserved. Experimentation led to combining several varieties of leaf, setting aside those which contained chiefly the bitter principle—since known to be cocaine—and selecting those which contained the aromatic alkaloids. An extract of these blended leaves embodied in a wholesome wine was found to represent the peculiar virtue of Coca as so much prized by the native users.

There is no secret other than method claimed in the process which has made the name of its inventor synonymous with that of Coca. It is certain that the preparations of Coca manufactured by Mariani

107. Markham; p. 152 *et seq.;* 1862.

are entirely different in aroma and action from other Coca preparations which I have examined. These latter have not the agreeable flavor of Coca, but the fluid extracts are usually bitter and the wines have a peculiar birchlike taste comparable with the smell of an imitation Russia leather. That this "musty cellar flavor," as it is technically termed, is due to the quality of Coca leaf was evidenced by a preparation of wine made for me in Paris in the fall of 1898, from choice leaves direct from the Caravaya district, which, however, were rich in cocaine.

It seems appropriate in a history of Coca that I should say something of the personality of one whose life work has been devoted to rendering the "divine herb" popular. It may be said that Coca is the hobby of Mariani. It is his recreation, his relaxation and constant source of pleasure, wholly removed from sordid commercial interests. At Neuilly, on the Seine, Paris, France, where his laboratory is located, his study is tastefully arranged with rich tapestries and carvings, in which the exquisite designs possible from conventionalizing the Coca leaf and flower are so artistically used as the motif of decoration that they are not obtrusive but must be pointed out in order to be recognized. Here he has extensive conservatories, which are filled with thousands of Coca plants of various species, among which he takes the greatest delight in experimenting upon peculiarities of growth and cultivation. From this collection specimen plants have been freely distributed to botanical gardens in all parts of the world.

I am convinced no more happy realization can occur to this savant than the knowledge that his efforts to render Coca popular and available have met with a spontaneous approval from representative personages in various parts of the world. Entirely aside from any personal interest, a voluminous testimony has literally showered in from those whose motive and sincerity must be accepted as an unquestionable regard for recognized merit. Eminent artists and sculptors have painted and chiseled some dainty examples which serve to typify their esteem for a modern elixir vitae. Roty, President of the *Académie des Beaux Arts,* and probably the most eminent living medalist, has executed a presentation medal of appreciation. Famous musical composers, such as Gounod, Faure, Ambrose Thomas, Massenet, and many others have sung their hosannas in unique bars of manuscript melody. Poets and writers without number have versed the qualities of the Coca leaf and the present happy idealization of its powers. Royalty has set upon it the meritorious seal of patronage, and the modern Church, more liberal than its edicts of long ago, has welcomed its use. Only recently Pope Leo XIII sent a golden medal of his ecclesiastical approval, for it is said that for years His Holiness

has been supported in his ascetic retirement by a preparation of Mariani's Coca, of which a flask constantly worn is, like the widow's cruse, never empty.

So numerous have been these expressions from eminent characters of the day, that it has been possible to compile from them a cyclopedia of contemporary biography which has already reached several large octavo volumes. A brief outline of each notable is given, with an etched portrait, and often accompanied by a sketch showing some known forte of the individual. Where these are artists their impromptu illustrations display a happy humor associated with their characteristic touch. The resultant compilations, exquisitely printed and bound as an *édition de luxe,* are much sought by bibliophiles. A short time since, while the Princess of Battenberg was on a visit at Nice, she was presented with one of these copies, and in acknowledging the courtesy suggested that her mother, the Queen of England, would be delighted to have one for her private library. In fulfillment of such a hint, which was accepted as an imperial command, two sets, especially illuminated by Atalaya, were forwarded to Her Majesty, who wrote that she considered them among the finest specimens in her collection.

With this first advance in securing the properties of the leaf in convenient form for use, came the important researches of Niemann upon the alkaloids of the Coca leaf. The work of this investigator was speedily followed by a host of ardent experimenters. The more pronounced advantages, however, which were to benefit all humanity, were not immediately utilized, and for nearly a generation cocaine was regarded as but an expensive curiosity of the laboratory.

In 1884 the attention of the scientific world was suddenly concentrated on the remarkable possibilities of the Coca leaf through the discoveries of Dr. Carl Koller, on the application of cocaine to the surgery of the eye. Manufacturing chemists turned their attention to the parent plant, for there was a desire to make the product now brought so prominently into great demand as to be held at exorbitant prices.

Among my classmates, in the medical department of the University of the City of New York, was my friend Henry H. Rusby, then regarded as a botanist of great promise, and at present Professor of Materia Medica of that university and of the New York College of Pharmacy. Immediately after his graduation he went to South America on a botanical expedition for Parke, Davis & Co., and they forwarded instructions to him to devote sufficient time to study Coca in its native home.[108] The result of his research is full of interest as

108. *Person. com.;* Parke, Davis & Co.; March, 1898.

showing the similarity between modern customs of Coca cultivation, as compared with the descriptions of the early Spanish historians. These investigations were chiefly carried out in the district of Coroico, of the Yungas of Bolivia. This botanist was the first to clearly show that: "the best quality of Coca leaves, to a manufacturing chemist, means those which will yield the largest percentage of crystallizable cocaine, while the same leaf might be considered for domestic consumption as representing one of the lower grades." For, as he has explained: "The Indian selects a Coca rich in the aromatic and sweet alkaloids instead of the bitter leaf in which cocaine is predominant."[109] Since 1885, most of the writings and the experiments of physiologists upon Coca seem to have been based upon the idea of a single active principle which should represent the potency of the leaf. As is clearly indicated in the history which has been traced through nearly four centuries, this is a false supposition. The qualities of Coca are not fully represented by any one of its alkaloids thus far isolated.

The Indians chew Coca just as they do everything else, very deliberately and systematically. The mouthful of leaves taken at each time is termed *acullico,* or *chique,* which is as carefully predetermined as would the skilled housewife apportion the leaves of some choice *bohea* intended for an individual drawing. In preparing the chew the leaf is held base in between the two thumbs, parallel to the midrib, the soft part of the leaf being stripped off and put in the mouth. From the constant presence of this quid through many years the cheek on the side in which it is usually held presents a swollen appearance known as *piccho.* It is an error to suppose that the Indian journeys along and plucks the Coca from bushes by the wayside to chew, for the leaf must be carefully picked, dried and cured, and, just as tobacco or tea or coffee has to undergo certain processes before ready for consumption, so the full property of the Coca leaf is only developed after a proper preparation. Usually carried in the *chuspa,* or *huallqui,* with the leaves, or fastened to it outside, is a little flask or bottle made from a gourd and called *iscupuru.*[110] The word is not Quichua, but belongs to the dialect of the *Chinchay-suyus* along the banks of the Marañon. The Spanish authors termed it *popóro.*[111] In this gourd is carried a lime-like substance made from the ashes left after burning certain plants or by burning shells or limestone.[112] This,

109. Rusby; *person. com.;* 1898.

110. *Iscu,* lime; *puru,* gourd.

111. Oviedo wrote it *baperón;* Vol. II, p. 286; 1556.

112. Herndon; Vol. I, p. 132; 1853.

which they term *llipta,*[113] or *llucta,*[114] is intermixed with the leaves when chewing by applying it to those in the mouth with a short stick dipped into the gourd from time to time. After this application the lime left on the stick is wiped about the head of the gourd in an abstracted way, leaving a deposit of lime which increases with time, for the Indian never parts with his *popóro.* M. Gaugnet presented M. Mariani with a *popóro,* brought from Colombia, a cast of which in my possession well represents this formation.

The operation of chewing is termed in Bolivia and Southern Peru *acullicar,*[115] while in the North it is called *chacchar.*[116] The *llipta* is made in different localities from various substances; in the South from the ashes of the algarroba,[117] the fruit of which has an immense reputation as an aphrodisiac, the mass being held together with boiled potatoes, while in the North quicklime is used, and in some of the montaña regions ashes of the *musa*[118] root or that of the common cereus are employed. The ashes of the burnt stalk of the quinoa plant, *chenopodium quinua,* mixed with a little lime, is the ordinary preparation. In Caravaya the *llipta* is made in little conelike lumps;[119] in other places it is found in flat dried cakes, which are scratched into a powder with a stick as it is required for use. Tschudi mentions the use of sugar with the leaves, but this must have been a European innovation which was supposedly an improvement, but not warranted by local customs. In Brazil, Coca—or *ypadú* as there termed, is powdered and mixed with the ash of *Cecropia palmata* leaves.[120]

Ernst has traced the derivation of a number of the terms which are applied to the use of Coca among the Colombian Indians. These have been built up from the name of the gourd used to carry the lime or from the little sack in which the leaves are carried, which is always worn by the Indian. Thus the Chibchas term the alkali *anna,* which signifies a bluish lime.[121]

Dr. Monardes speaks of the use of tobacco combined with Coca and says of the Indians: "When they will make themselves to be out of judgment they mingle with the Coca the leaves of the tobacco, at which they totter and go as though they were out of their witts, or

113. Von Tschudi; 1840.
114. Paz Soldan; 1862.
115–116. Von Tschudi; 1840.
117. Paz Soldan; 1862.
118. Von Tschudi; 1840.
119. Markham; 1862.
120. Schlechtendal; 1834.
121. Uricoechea; 1871.

if they were drunk, which is a thing that doth give them great contentment to be in that sorte." [122] Tobacco is still mixed with Coca by some of the Colombian Indians, but it is doubtful if such a mixture alone would produce the effect described. The hallucinations and narcotic action attributed by early writers to Coca are largely confusional from imperfect facts.

The Indians have fixed places along the road where they rest and replace their chews of Coca. Usually it is in some spot sheltered from the wind; and if near one of these retreats, they will hurry until reaching there, where they may drop exhausted, and after resting for a few moments will begin to prepare the leaves for mastication. In about ten minutes they are *armado*—as it is termed, or fully prepared to continue their journey. The distance an Indian will carry his *ccepi* —or load, of about a hundred pounds, under stimulus of one chew of Coca is spoken of as a *cocada,* just as we might say a certain number of miles. It is really a matter of time rather than distance, the first influence being felt within ten minutes, and the effect lasting for about three-quarters of an hour, during which time three kilometres on level ground, or two kilometres going up hill, will usually be covered.[123] Although the roads are marked out with league stones, the exact number of miles these represent is a varying quantity, and travellers soon fall into the local habit of computing distance by the *cocada* as more exact.

These *ccepiris*—or burden bearers, which is the Quichua term or *cargaderos*—as they are termed on the coast, commonly travel six to eight *cocadas* a day without any other food excepting the Coca leaf used in the manner as indicated. It is not at all unusual—as related by numerous travellers—for a messenger to cover a hundred leagues afoot with no other sustenance than Coca. The old traditional *chasqui,* or courier, who has been continued since the time of the Incas, is still given messages to carry on foot rather than by horse or mule. He always carries a pack, which is fastened on his back and to his head also, leaving both arms free; and where the road is so steep that he cannot walk he will scramble along on all fours very rapidly. When the Indians come to their resting place they throw off their burdens and squat down, and the traveller might just as well decide to rest here as to attempt to go on. All persuasion would be just as useless to induce a resting Indian to proceed as it would be in the case of their favorite beast of burden, the llama, which is as unalterable of purpose as is his master.

122. Clusius, *trans.,* 1601.

123. Raimondi; 1874; also Herndon; I, p. 146; 1853.

The amount of Coca that is used by an Indian in a day varies from one to two handfuls, which is equivalent to one or two ounces. The leaves are not weighed out, but are apportioned to each man in accordance with the amount of work that is to be done. As an extensive operator in Peru expressed it to me, "the more work the more Coca," while conversely, the more Coca the more work they are capable of doing. If the placid calm of an Indian is ever ruffled, it is only manifest through his taking an extra chew.

Away up in the cold and barren regions of the mountains wood and brush are too scarce to supply fuel, so the dried droppings of the llama are used instead; and as no one ever thinks of having a fire in this region merely for the purpose of keeping warm, this fuel is only used for cooking and necessity soon corrects any over-fastidiousness in the epicure. One of the remarkable peculiarities of the llama is that the beast deposits this mountain fuel always in the same places; a whole herd will go to one fixed spot, and so greatly lessen the labor of gathering the dung. In some of the particularly dangerous passes in the mountains there are rude crosses erected, which have been set up by the missionaries to mark the piles of sacred stones of the early Incan period. These stone piles are often far removed from loose stones, which must be carried for a long distance in anticipation of adding to the heap. As the Indian makes his offering he also expects all travellers as they pass to make a like obeisance to the god of the mountain, expressive of gratitude for a journey that has been safe thus far, and imploring a favorable continuance. Often these places are decorated with little trinkets, which are hung upon the arms of the cross or thrown upon the pile of stones. Any object that has been closely attached to the person is offered; sometimes this may be even so simple as a hair from the eyebrow, but commonly the cud of Coca is thrown against the rocks, the Indian bowing three times and exclaiming—"*Apachicta,*" which is an abbreviation of the term *Apachicta-muchhani,*[124] "I worship at this heap," or "I give thanks to him who has given me strength to endure thus far." The offering is made to *Apachic,* or *Pachacamac,* of whom the stone pile is an emblem. It is a curious fact that diametrically opposite on the globe, in that portion of Chinese Tartary where the priests are called *Lamas,* offerings are made by the natives to similar stone piles which are there termed *obos.*

Arduous as may be the task of the cargo bearer, the severest trial the Indian is subject to is mining. They commence this labor as boys of eight and spend the greater part of their lives in the mines. These

124. Rivero; 1854.

places are wet and cold, and the work is very hard. In getting out the ore the workers must use a thirty-pound hammer with one hand, while the carriers are obliged to bear burdens of about one hundred and fifty pounds up the steep ascent of the shaft to the surface. This mining is continuous, being carried on by two gangs of men, one of which goes on duty at seven at night, working until five in the morning, when, after a rest of two hours they continue until seven at night, and are then relieved by the other party. Some of the silver mines employ thousands of operatives, both men and women, the men working in the mine and the women breaking and sorting the ore which is brought to the surface. Unless there is at least twenty per cent of silver in the ore it is cast aside; and these women are so expert that as they break the stones into small pieces they determine instantly how it shall be sorted. A similar cleverness is shown on the part of the Indians who select the Coca or cinchona plants. They will walk rapidly through a nursery and determine at a glance the value of individual plants or of the whole field without apparent hesitation. The Indians do not always select mining through choice, but are almost driven to it through the influence of the authorities. They have a dreadful fear of temporal powers and dare not disobey, even though their inclinations might suggest that they were born agriculturists. But these people have no inclinations; they have always been taught to do as commanded. It is suggestive of an instance I once met with when a physician, in reprimanding his colored servant, asked him why he did a certain thing, to which the poor fellow started to explain by "I thought." "Thought!" said the doctor—"there you go thinking again; you have no right to think!" And so it is with these poor Indians; they can have no opinion, they have no right to think.

The Incas did a prodigious amount of work in their mining efforts, which, even if primitive, were forcible and effective. A system of waterways, similar to the extensive aqueducts of the coast, was made use of to conduct these operations, and several of these canals still exist, some many miles long. They are from three to five feet wide, and five to eight feet deep; in places cut through the solid rock, and in others, when over a porous soil, they are lined with sandstone. Numerous smaller ones were extended from the main canal, generally ending in reservoirs, from which sluice gates might be opened to permit the pent-up volume of waters to suddenly rush down a hill, carrying with it hundreds of tons of golden gravel. At the same time other streams were run along the base of the cliffs, undermining them, and by this ancient method of hydraulic mining, continued through centuries, whole mountains have been washed away. At Alpacata, in the upper part of Aporoma, at an elevation of seven thousand five

hundred and fifty feet, is still to be found one of these old canals, together with the huge tanks for storing water, in a fair state of preservation.

An engineer, extensively interested in mining interests, who spends several months of each year in Peru, has described to me the peculiar methods followed by the Indians, who sometimes conduct their gold washings in the streams to their own profit. Selecting a part of some river bed that is left without water during the dry season, the Indian paves it with large sloping stones, forming a series of riffles. When the freshets of the rainy season cause the stream to rise and overflow these paved spots, any gold carried down is caught between the stones and is gathered during the following dry season. The annual returns from such farms are almost exactly the same each year, so that the Indian may count with as great accuracy on the yield of gold from his several mining *chacras* as he would upon the products of his corn or Coca fields. This primitive form of mining is still carried on to a limited extent, and these gold farms are handed down from father to son as regular property. The Indians appear to have an intuitive and very accurate knowledge of the relative richness of the various streams, but their natural reticence makes it extremely difficult to gain this information from them.

As one travels up the mountains the glaring rays of the sun, bursting through some gorge, are so dazzling, especially when falling upon the new-laid snow, as to occasion much inconvenience. *Surumpe*—as this snow blindness is termed, is a very common affection of the Indians, which the traveller must guard against by wearing protecting goggles. Added to this disability is the *zoroche,* or mountain sickness, induced by the rarefied atmosphere of the high altitudes. This often comes on suddenly without any premonitory symptom; at times it may be wholly absent, or it may be manifest all the way from a nervous irritability or uncomfortable fullness in the head and palpitating heart to complete prostration, suggestive of collapse. At times travellers may drop from the saddle from sheer muscular weakness, and Squier relates having drawn off his glove to go to the assistance of one of his party who had thus fallen, when they were at an altitude of 14,750 feet, and being surprised to see blood oozing from the pores of his own hand. Upon reaching his companion he found him nearly senseless, with blood trickling from his mouth, ears, nostrils and the corners of his eye. Copious vomiting followed, the condition being relieved by the application of the usual restoratives. It is very unusual that such serious symptoms are shown, and *zoroche,* like seasickness, does not often excite even sympathy, while, like *mal de mer,* often after one has experienced a first attack, they may never be troubled

again, or they may be similarly affected upon every occasion when going into high altitudes. It is remarkable how utterly prostrated one will feel under the influence of *zoroche,* the most speedy relief from which is to lie flat and perfectly still until sufficiently recovered to continue the journey. The slightest movement seems to be a difficulty, and just as the poor seasick victim, at first afraid he will die, becomes finally so physically demoralized through his suffering that he is afraid he will not die, so the subject of mountain sickness in its severity prays to be left alone to what seems his inevitable and immediate end. Rest and a judicious use of Coca, now best taken as an elixir or wine, acts so magically as to soon change all this, and the sufferer lives to enjoy the bounties which Nature has in store in brighter, smiling scenes beyond.

Even the animals suffer from an impossibility of taking in sufficient stimulus in the thin air of high altitudes, and the owners of the mules often slit the nostrils of their beasts—when they have not already been cut through from thistle eating—so as to remove even the slightest impediment to deep breathing. It is not known that the mules have been induced to feed upon Coca leaves, as the horses of the far East are sustained by opium, but their suffering is supposedly relieved by the odor of garlic; and the *arriero,* ever mindful of the welfare of his charge, attempts to relieve the trembling and panting beasts by rubbing over the foreheads of these animals an ointment made of tallow, garlic and wild marjoram. Some of the Indians have peculiar ideas about this disability, which they call *veta*—or vein, because they believe it is occasioned by a vein of metal in the mountains diffusing around some poisonous influence and so contaminating the atmosphere. But whatever his interpretation as to the cause may be, the Indian knows from experience that if Coca will not wholly prevent, it will speedily relieve this annoyance; and its use for this purpose is mentioned in all the historical accounts of the Andeans. All travellers who have written of their journeys over these mountains, speak in praise of this particular property of Coca. Dr. Benjamin F. Gibbs, U.S.N., in his report on Coca to the United States Government, attributes this great virtue to the direct action of Coca in stimulating the cardiac muscular fibre, thus assisting the natural force of the heart to make its greatest effort to pass the summit of the Andes.[125]

One of the frequent disabilities for both man and beast travelling in the mountain is *empacho,* or indigestion, probably induced not only by irregularity in eating, but by improper and insufficient food, as well as imperfect oxygenation. Against this condition Coca exerts

125. *Sanitary and Medical Report,* U.S.N., 1873–4, Washington, 1875.

an influence by the increase of respiratory power, as well as increased capacity in the heart, holding at the same time hunger and thirst in abeyance, for it not only does not impair appetite in the least, but increases it; and when opportunity offers, the Indian who has gone for days without food will dispose of a meal with a deliberation and fixedness of purpose that is astonishing. Dr. Weddell, in speaking of this property of Coca in sustaining the strength without food, particularly refers to this fact, and says that it did not impair the appetites of the Indians who accompanied him in his travels and who chewed the leaf incessantly, yet who, in the evening, at the completion of their labors, always ate ravenously of a quantity sufficient to compensate fully for any omissions since the previous meal.

Through these long mountain journeys, where it is necessary to carry the food supply, the Indians use the indigenous potato—*papa,* as they term it, which is found throughout Peru in great variety, and which they prepare for their use by numerous ways of preservation of drying and freezing. *Chuno* is made by soaking the common potato in water for several days and then pressing out the moisture and freezing the pulp, while *Chochoca* is another frozen preparation, and both of these have long proved so serviceable in the journeys on the Andes that Rivero suggested such a form of preparation might be desirable to add to the supplies of the army and navy. *Oca* is a species of potato of a purple color; it is a favorite article of diet from which *caya,* another preserved variety, is made. *Mashua* is made from *oca* by rotting it until it is so offensive that no palate but that of an Indian accustomed to such dainties could tolerate it. *Macas* is a potato tuber which when boiled looks and tastes like turnips. The Indians expose it in the frost and sun for a number of days, and then dry it indoors and prepare a sort of syrup from it which smells very offensive, but is said to be a stimulant to reproduction. On the mountains there grows a yellow potato—the *amarillo,* which is far superior to anything similar found in our markets; it will only grow at a certain elevation and has resisted all efforts of cultivation elsewhere by degenerating, after the first crop, into the common variety. Preserved meats are carried in the mountains as *charqui*—or jerked beef, which is the whole carcass of a sheep, dried in cold air; but alcohol is never forgotten on these trips, and the Indian will drink it straight, if it is given to him; for although his reliance is upon Coca as of necessity for the force and endurance it gives, he loves alcohol for its own sake. It is as was once expressed to me by a plethoric individual of our own clime, "I don't drink because I need it, doctor, but because I like the taste of it." The application that alcohol is a spur or whip to urge on over some immediate emergency, while Coca is an imparter of

continuous force, is well illustrated by a story told of some Indians to whom whiskey had been given, and upon being asked an opinion as to its influence, one fellow replied: "Coca helps a man to live, but whiskey makes him row a boat." [126] This is an empirical application which has been fully determined by physiological fact, which establishes an alcoholic preparation of Coca—such as Coca wine—as an ideal tonic-stimulant, possessing not only immediate but lasting effects.

In looking through the log book of an Andean traveller with reference to the burdens carried by the Indians, I remarked that the packs for the party were chiefly made up of Coca, preserved foods and sugar alcohol, the first and last being predominant. The food supply in travelling over the mountains is one of the most serious problems, and at best the preserved foods are not very inviting, while it requires a good appetite and vigorous imagination to enjoy the compact portion of dried compounds, offered as an available ration. A gentleman recently returned from a trip across the Andes expressed himself of the belief that people commonly eat too much, and that during his sojourn there he had been forced, through sheer necessity, to be abstemious in eating, and for days at a time had lived upon Coca because it was the only thing convenient in the supplies at hand, but as a result he felt not only more strong, but younger.

The Indians carry a pack of from eighty to one hundred pounds, the amount of burden for both men and mules being regulated by law in the several districts, being less on the Eastern Andes than on the western cordillera, while the pay is the same. The wages of these carriers is sixteen cents of our money a day; yet these people work on amidst all inclemency of weather, through shifting seasons from increased altitude, willing and contented, with a *cusi-simirac,* or happy smile, so long as *callpa,* or force, be sustained with the essential Coca.

The first attempt at any technical description of Coca was that made by Monardes some years after the early publication upon the conquest of Peru. The earliest purely botanical classification appears to be that of Plukenet, in 1692. He describes the "Mamacoca," or the "Mother of Coca," as the deified name used among the Peruvians.[127] About a generation later Antoine de Jussieu described the specimens which he had received from his brother Joseph while he was with the expedition of La Condamine. Jussieu placed Coca in the family of the *Malpighiaceae* of the genus *Sethia* because of certain characteristics of the leaf and the three-compartment fruit. Cavanilles, who drew his account and his illustrations of the plant from these examples, which

126. Rusby; *person. com.;* 1898.

127. Plukenetii; *mantissa* 25; 1692.

were preserved in the herbarium of the Museum of Natural History at Paris, also followed this classification.

Dr. Browne in 1756, in his *Natural History of Jamaica,* included Coca among the plants of that region and placed it in the family *Erythroxylum*, deriving this generic name from the red color of the wood of some local species.[128] About this same time Linnaeus placed Coca in the family of the *Erythroxyleae* of the genus *Erythroxylon,* and subsequently this classification was followed by Antoine Laurent de Jussieu, a nephew of Joseph, who changed the classification from *Malpighiads* because of certain characteristics of the Coca flower.

The observation was made by the poet Goethe in his "Metamorphosis of Plants," that the flower was merely a reproduction of the modified plant leaf, just as the stem, trunk, stalk or root is shaped to satisfy particular requirements, all originating from the germinal embryo in the seed. Because it determines the perpetuation of the plant, botanists regard the flower as an important organ in the consideration of any classification.

The *Erythroxylons* differ from the *Malpighiads* by their flowers growing from amongst small imbricated scales, having no glands on the calyx, capitate stigmas, and having the ovules united superiorly. Lamarck has followed the classification of Antoine Laurent de Jussieu, and this has since been regarded by the majority of authorities as classic.

One of the most marked characteristics of the Coca leaf is the areolated portion bounded by two longitudinal elliptical lines curving toward the midrib. These lines are commonly more conspicuous on the under surface of the leaf. The areolated portion is slightly concave, and of a deeper color than the rest of the leaf, probably from a closer venation. This peculiarity is not confined to the *Erythroxylon Coca.* It is marked in *E. areolatum.* In many other species, where there are no demarking lines, the leaves are sometimes marked by similar bud pleatings or have a peculiar color bounding the area. In his early account of this species Browne described the leaf as: "Marked with two slender longitudinal lines upon the back which were the utmost limits of that part of the leaf which was exposed while it lay in a folded state."

Some botanists have considered the characteristic lateral lines of the Coca leaf as nerves. Martius was of the opinion these result from pressure of the margin of the leaf as it is rolled toward the midrib while in the bud, the pinching of the tissue causing the substance of the leaf to be raised, resembling a delicate nerve. The lines have been

128. Patrick Browne; p. 278; 1756.

designated as "tissue folds," [129] but there is no fold in either the epidermis or substance of the leaf. Histologically the lines are formed by a narrow band of elongated cells, which resemble the collenchyma cells of the neighboring epidermis,[130] and these doubtless serve to stiffen the blade. The lines have no connection with the veins of the leaf and in transmitted light seem like mere ghostly shadows which vanish under closer search.

Many observers have supposed they had found the original locality of wild Coca. Alcide d'Orbigny describes in his travels, having entered a valley covered with what he supposed to be the wild Coca shrub, but thinking he might be mistaken, he showed the plant to his mule driver, who was the proprietor of a cocal in Yungas, and he pronounced it undoubtedly Coca and gathered a quantity of the leaves.[131] It has been asserted that wild Coca may be found in the province of Cochero,[132] and one of the former governors of Oran, in the province of Salta, on the northern borders of the Argentine Republic, claims to have found wild Coca of excellent quality in the forests of that district.[133] Poeppig also described having found wild specimens, known by the natives as Mama Coca, in the Cerro San Cristobal, near the Huallaga, some miles below Huanuco. These examples closely resemble the shrubs of cultivated Coca collected by Martius in the neighborhood of Ega, Brazil, near the borders of the Amazon, and correspond to the wild specimens commonly found throughout Peru.

In Colombia Humboldt, Bonpland and Kunth described *Erythroxylon Hondense* as the possible type of the originally cultivated Coca shrub, but there is a difference between the leaves of *E. Coca* and *E. Hondense* in the arrangement of their nervures, from which Pyrame de Candolle considers them as entirely distinct species. Andre speaks of Coca in the valley of the river Cauca as in abundance in both the wild and half-wild state, but an excellent authority denies that Coca is found wild in Colombia.[134]

The exact locality where Coca is indigenous in a wild state has, however, never been determined. Though there are many Coca plants growing throughout the montaña outside of cultivation, it is presumed that these are examples where the seeds of the plant have either been

129. Hananseck; 1885.

130. Schrenk; 1887.

131. D'Orbigny; 1830.

132. Peyritsch; 1878.

133. Villafane; 1857.

134. Triana and Planchon; p. 338; 1862.

unintentionally scattered or else are the remains of some neglected plantation where might have flourished a vigorous cocal under the Spanish reign. There are evidences of these scattered shrubs throughout the entire region where Coca will grow, but there is no historical data to base a conclusion that these represent wild plants of any distinct original variety, while the weight of testimony indicates that they are examples of the traditional plant which have escaped from cultivation.

Although the heart of the habitat of Coca is in the Peruvian montaña from 7° S., north for some ten degrees, the shrubs are found scattered along the entire eastern curve of the Andes, from the Straits of Magellan to the borders of the Caribbean Sea, in the moist and warm slopes of the mountains, at an elevation from 1,500 to 5,000 and even 6,000 feet, being cultivated at a higher altitude through Bolivia than in Peru. Throughout this extent there are to be seen large plantations and many smaller patches where Coca is raised in a small way by Indians who come three or four times a year to look after their crop. In some localities, through many miles, these cocals cover the sides of the mountains for thousands of feet. During the Incan period the centre of this industry was about the royal city of Cuzco, and at present the provinces of Caravaya and of Sandia, east of Cuzco, are the site of the finest variety of Peruvian grown Coca. In this same region there grows coffee, cacao, cascarilla, potatoes, maize, the sugar cane, bananas, peaches, oranges, paltas, and a host of luscious fruits and many valuable dyes and woods.

There are still important Coca regions about Cuzco, and at Paucartambo and in several Indian towns along the Huanuco valley, situated in the very heart of the northern montaña and noted for its coffee plantations. At one time this region was accredited with supplying Coca for all Peru, which probably meant the mining centres of Huancavelica—formerly more prominent than at present—and Cerro de Pasco, where the mines are still extensively worked. There are fine cocals at Mayro, on the Zuzu River, and at Pozuso—which are German colonies; at the latter place is located the laboratory of Kitz, one of the largest manufacturers of crude cocaine, whose product supplies some of the important German chemical houses. Still further to the northwest—in Colombia, there are a number of small plantations along the valley of Yupa, at the foot of the chain of mountains which separates the province of Santa Marta de Maracaibo, at the mouth of the Magdalena River. Eastward from the montaña Coca is cultivated near many of the tributaries of the Amazon, and through some portions of Brazil, where it is known as *ypadú (E. Pulchrum,* St. Hil.). The Amazonian

plant is not only modified in appearance,[135] but the alkaloidal yield is inferior.[136]

The temperature in which Coca is grown must be equable, of about 18° C. (64.4° F.). If the mean exceeds 20° C. (68° F.), the plant loses strength and the leaf assumes a dryness which always indicates that it is grown in too warm a situation, and though the leaves may be more prolific, they have not the delicate aroma of choice Coca. It is for the purpose of securing uniform temperature and appropriate drainage that Coca by preference is grown at an altitude above the intense heat of the valleys, and where it is virtually one season throughout the year, the only change being between the hot sun or the profuse rains of the tropical montaña. As the temperature lowers with increase of altitude, when too great a height is reached the shrub is less thrifty and develops a small leaf of little market value, while as only one harvest is possible the expense of cultivation is too great to prove profitable. Even close to the equator, in the higher elevations, there is always danger from frost, and for this reason some of the cocals about Huanuco have at times suffered serious loss. All attempts at Coca cultivation on a profitable scale near to Lima have failed not only because of the absence of rain, but because the season's changing is unsuited.

A peculiar earth is required for the most favorable cultivation of Coca, one rich in mineral matter, yet free from limestone, which is so detrimental that even when it is in the substratum of a vegetable soil the shrub grown over it will be stunted and the foliage scanty. While the young Coca plants may thrive best in a light, porous soil, such as that in the warmer valleys, the full grown shrub yields a better quality of leaf when grown in clay. The red clay, common in the tropical Andes, is formed by a union of organic acids with the inorganic bases of alkaline earths, and oxides—chiefly of iron—which in a soluble form are brought to the surface by capillarity. These elements enter the Coca shrub in solution through its multiple fibrous root, which looks like a veritable wig. The delicate filaments are extended in every direction to drink in moisture, and as these root-hairs enter the interspaces of the soil, the particles of which are covered with a film of water, absorption readily takes place. The clay soil of the montaña affords this property in a high degree, while the hillside cultivation admits of an appropriate drainage of the interspaces without which the delicate root would soon be rotted. As the water is absorbed from the soil, a flow by capillarity takes place to that point, and so the Coca root will drain a considerable space.

135. Poeppig; 1835.

136. Parke, Davis & Co.; *person. com.;* 1898.

It is possible a metallic soil may have some marked influence on the yield of alkaloid. At Phara, where the best Coca leaves are grown, the adjacent mountains are formed of at least two per cent of arsenical pyrites, a fact which is noteworthy because this is the only place in Peru where the soil is of such a nature. Most of the soil of the Andean hills where the best Coca is grown, originates in the decay of the pyritiferous schists, which form the chief geological feature of the surrounding mountains. This, commonly mixed with organic matter and salts from the decaying vegetation, or that of the trees burned to make a clearing, affords what might be termed virgin earth—*terre franche ou normale*—which requires no addition of manures for invigoration. In the conservatory it has been found, after careful experimentation, that a mixture of leaf mould and sand—*terre de bruyère,* forms the best artificial soil for the Coca plant.[137]

Aside from an appropriate soil that is well drained, there is another important element to the best growth of Coca, and that is a humid atmosphere. Indeed, in the heart of the montaña it is either hazy or drizzling during some portion of the day throughout the year, the intense glare of the tropical sun being usually masked by banks of fog, so that it would seem that one living here is dwelling in the clouds. At night the atmosphere is loaded with moisture and the temperature may be a little lower than during the day, though there is usually but a trifling variation day after day.

The natural life of the Coca shrub exceeds the average life of man, yet new Cocals are being frequently set out to replace those plants destroyed through accident or carelessness. The young plants are usually started in a nursery, or *almaciga,* from seeds planted during the rainy season, or these may be propagated from cuttings. In the conservatory slips may be successfully grown if care is taken to retain sufficient moisture about the young plant by covering it with a bell glass.[138] The birds are great lovers of Coca seeds, and when these are lightly sown on the surface of the nursery it is necessary to cover the beds at night with cloths to guard against "picking and stealing." Before sowing the seeds are sometimes germinated by keeping them in a heap three or four inches high and watering them until they sprout. They are then carefully picked apart and planted,[139] either in hills or the seeds are simply sown on the surface of the ground, "and from that they take them up and set them in other places into earth that

137. Mariani; *person. com.;* 1899.

138. Mariani; *person. com.;* 1899.

139. Rusby; *person. com.;* 1898.

is well labored and tilled and made convenient to set them in." [140] There is commonly over the beds of the nursery a thatched roof—*huasichi,* which serves as protection to the tender growing shoots from the beating rain or melting fierceness of the occasional sun. The first spears are seen in a fortnight, and the plants are carefully nourished during six months, or perhaps even a year until they become strong enough to be transplanted to the field.

As a rule, all plants that are forty or fifty centimetres high (16 to 20 inches) may be set out, being "placed in rows as we might plant peas or beans." [141] In some cases they are set in little walled beds, termed *aspi,* a foot square, care being taken that the roots shall penetrate straight into the ground. Each of these holes is set about with stones to prevent the surrounding earth from falling, while yet admitting a free access of air about the roots. In such a bed three or four seedlings may be planted to grow up together, a method which is the outgrowth of laziness, as the shrubs will flourish better when set out singly. Usually the plants are arranged in rows, termed *uachas,* which are separated by little walls of earth—*umachas,* at the base of which the plants are set. In some districts the bottle gourd, maize, or even coffee, is sown between these rows, so as to afford a shield for the delicate shoots against sun or rain. At first the young plants are weeded —*mazi* as it is termed—frequently, and in an appropriate region there is no need for artificial watering; but the Coca plant loves moisture, and forty days under irrigation will cover naked shrubs with new leaves, but the quality is not equal to those grown by natural means.[142]

In from eighteen months to two years the first harvest, or *mitta,* which literally means time or season—is commenced. The leaves are considered mature when they have begun to assume a faint yellow tint, or better—when their softness is giving place to a tendency to crack or break off when bent, usually about eight days before the leaf would fall naturally. This ripe Coca leaf is termed by the Indians *cacha.*

The Coca shrub, growing out of immediate cultivation, will sometimes attain a height of about twelve feet, but for the convenience of picking, cultivated plants are kept down to less than half that height by pruning—*huriar* or *ccuspar*—at the time of harvesting, by picking off the upper twigs, which increases the lateral spread of the shrub. The first harvest—or rather preliminary picking, is known as *quita calzón,* from the Spanish *quitar*—to take away, and *calzón*—breeches.

140. Monardes; 1580.

141. Monardes; 1580.

142. Weddell; 1853.

As the name indicates, it is really more of a trimming than what might be termed a harvest, and the leaves gathered at this time have less flavor than those of the regular *mittas*. Each of the harvests is designated by name—which may vary according to the district. The first regular one in the spring—*mitta de marzo*, yields the most abundantly. Then, at the end of June, there is commonly a scanty crop known as the *mitta de San Juan*—the harvest of the festival of St. John—while a third, following in October or November, is the *mitta de Todos Santos*—the harvest of all saints.

Usually the shrubs are weeded only after each harvest, and there seems to be a prejudice against doing this at other times, though if the cocals are kept clear the harvest may be anticipated by more than a fortnight.[143] Garcilasso tells how an avaricious planter, by diligence in cultivating his Coca, got rid of two-thirds of his annual tithes in the first harvest.

Picking exerts a beneficial influence on the shrub, which otherwise would not flourish so well. The gathering—*palla*—is still done by women and children—*palladores* as they are termed—just as was the custom during the time of the Incas, though the Colombians will not permit women to take part in the Coca cultivation at any time. Many writers have spoken of the extreme care with which the leaves are picked or pinched from the shrub, one by one; but to a casual observer the gathering seems to be done far more carelessly. The collector squats down in front of the shrub, and taking a branch strips the leaves off with both hands by a dexterous movement, while avoiding injury to the tender twigs. The pickers must be skilled in their work, for not only a certain knack, but some little force is requisite, as is shown by the wounds occasioned to even the hard skin of the hand of those who are accustomed to the task.

The leaves are collected in a poncho or in an apron of coarse wool, from which the green leaves—termed *matu*—are emptied into larger sacks—*materos*, in which they are conveyed to the drying shed—*matucancha*. Four or five expert pickers in a good cocal can gather a *cesta* —equivalent to a bale of twenty-five pounds, in a day. Harvesting is never commenced except when the weather is dry, for rain would immediately spoil the leaves after they have been picked, rendering them black in color and unsalable, a condition which the Indians term *Coca goñupa*, or *yana Coca*.

Coca when gathered is stored temporarily in sheds—*matuhuarsi*, which open into closed courts, the *cachi*, or *matupampa*, and the con-

143. Garcilasso; Hakluyt; 1871.

tents of the warehouses indicate the prosperity of the master of the cocal.[144] In the drying yards of these places the leaves are spread in thin layers two or three inches deep, either upon a slate pavement —*pizarra,* or simply distributed upon a hard piece of clear ground of the *casa de hacienda.* The closest guardianship must now be maintained over the leaves during the process of drying, and on the slightest indication of rain they are swept under cover by the attendants with the greatest rapidity. Drying may be completed within six hours in good weather, and when properly dried under such favorable conditions, the leaf is termed *Coca del dia* and commands the highest price. A well cured mature Coca leaf is olive green, pliable, clean, smooth and slightly glossy, while those which are old or are dried more slowly assume a brownish green and are less desirable. After drying, the leaves are thrown in a heap, where they remain about three days while undergoing a sort of sweating process. When this commences the leaf is crisp, but sweating renders it soft and pliable. After sweating the leaves are again sun dried for a half hour or so, and are then ready for packing. If the green leaves cannot be immediately dried, they may be preserved for a few days if care be taken not to keep them in heaps, which would induce a secondary sweating or decomposition and give rise to a musty odor, termed *Coca ccaspada,* which clings even to the preparations made from such leaves.

The refinement of curing maintains a certain amount of moisture in the leaf, together with the peculiar Coca aroma, and it is exact discernment in this process which preserves the delicacy of flavor. When drying has been so prolonged as to render the leaf brittle and without aroma, the quality of Coca is destroyed. It has been suggested that an improvement might be made in drying through the use of sheds, where the leaves could be exposed in layers to an artificial heat, and a current of dry air, after the manner of the *secaderos* used in Cuba for drying coffee. But whether because of an unwillingness to adopt new methods, or because of some peculiar influence of the atmosphere imparted to the leaf in the native way of drying, all attempts to employ artificial methods have proved unsatisfactory.

The exquisite little creamy white flower of Coca is seen in the fields of the cocals after each harvest, the flowering continuing for about two weeks. The Coca plants which were presented to the New York Botanical Garden have continued to blossom at irregular intervals throughout the year, while M. Mariani told me that the shrubs grown in his conservatories flower in October. The blossoms are very delicate and the petals quickly fall.

144. Gosse; 1861.

When the fruit has formed it changes color in ripening, through all the hues from a delicate greenish yellow to a deep scarlet vermilion, and upon the same shrub there may be a number of such colorations to be seen at one time. Monardes, writing centuries ago, said: "The fruit is in the form of a grape, and as the fruit of the myrtle is reddish when it is ripening, and about of the same dimensions—when attaining its highest maturity becoming darker black." I was going to say that the fruit resembles the smallest of oval cranberries, both in color and in shape, for I at one time found some little cranberries which appeared so much like the Coca fruit as to seem almost identical; but all cranberries are not alike, and there has already been too much confusion in hasty comparison, so I shall reserve my description for the more technical details. The fruit is gathered while yet scarlet during the March harvest, but if it is permitted to remain on the bush it becomes dark brown or black and shrivels to the irregular lobing of the contained nut.

In selecting the seeds care is taken to cast aside all fruit that is decayed, the balance being thrown into water, and those which are light enough to float are rejected as indicating they have been attacked by insects. The balance are then rotted in a damp, shaded place, to extract the seed, which is washed and sun dried. When it is desired to preserve these any length of time the fruit is exposed to the hot sun, which dries the fleshy portion into a protective coating. But the seeds do not keep well. In Peru perhaps they will retain germinating power for about fifteen days, while those from plants grown in the conservatory must be planted fresh, when still red, for if allowed to dry they become useless.[145]

With every detail to cultivation which tradition has inspired, the Coca crop is not always secure, for the cocals are subject to the attacks of several pests, which, while a constant source of annoyance may at times seriously damage the shrubs. Below an altitude of four thousand feet there is the *ulo*, a little butterfly, which during a dry spell deposits its eggs, and as the grubs develop they devour the younger leaves. In the older cocals an insect called *mougna* sometimes introduces itself into the trunk of the shrub and occasions its withering. M. Grandidier speaks of a disease termed *cupa*, or *cuchupa*, in the valley of the Santa Marta, which has destroyed an entire crop within eight days. From an attack of this not only the immediate leaf is rendered small and bitter, but during the following year the shrub remains unproductive, and a gall-like excrescence is developed termed *sarna mocllo*—seeds of gall. Some cultivators at the first indication of this disease prune

145. Mariani; *person. com.;* 1899.

the affected twigs and so succeed in raising a new crop by the next harvest.

The ant, *cuqui,* which is a great pest through all the montaña, is a dangerous evil to the Coca plant. It not only cuts the roots, but disintegrates the bark and destroys the leaves, and in a single night may ruin an entire plantation. In fact, the sagacity of the traditional ant is outdone by these pests. Some of them are capable of carrying a kernel of corn, and an army of them will run off with a bag of corn in a night, kernel by kernel, making a distinct trail in the line of their depredations. They build their nests of leaves, twigs and earth, and even construct an underground system of channels to supply their hillocks with water. It is extremely difficult to keep them out of a cocal, as they will burrow under the deepest ditches, and the only method of being free from them is to destroy their hills wherever they are found. Another enemy to the shrub is a long bluish earthworm, which eats the roots and so occasions the death of the plant. Then a peculiar fungus, known as *taja,* forms at times on the tender twigs, occasioned by injury or from poor nutrition. Aside from these pests, there are a number of weeds which are particularly injurious to Coca, among which are the *Panicum platicaule, P. scandens, P. decumbens, Pannisetum Peruvianum, Drimaria,* and *Pleris arachnoidea.*[146] These plants grow rapidly and take so much nourishment from the soil as to destroy the nutrition of the Coca shrub. For a similar reason the planting of anything between the rows is now abandoned.

There grows on the trunks and branches of the older Coca shrubs various species of lichens, termed *lacco,* which, while not known to be detrimental, may even have a marked influence on the alkaloidal yield of the leaf. Two very pretty specimens in the herbarium of Columbia University show the *Parmelia* and *Usnea.* These formed part of a collection made by Miguel Bang, during 1890, in the Province of Yungas, Bolivia, from a cocal at an altitude of 6,000 feet.[147]

In describing any plant it is the ideal of botanists to base their studies upon an example growing under natural conditions. It is inferred that cultivation causes a variability which may occasion considerable alteration from the original type. Considering the centuries elapsed during which we have any historical references to the use of Coca among the Peruvians, it is remarkable to note how uniformly the characteristics of the plant are continued. Even at the period of the Spanish invasion there was a tradition which traced its revered use among the Incans back through many centuries, when it was employed

146. Poeppig; 1836.

147. Distributed by Drs. Britton and Rusby.

for the precise purposes for which it has been continued. Yet for hundreds of years after the first facts concerning Coca were introduced into Europe the available knowledge was largely lengendary, and because of the phenomenal properties always assigned to its use Coca was commonly regarded as fabulous. During all this period, however, the plant has maintained its classic peculiarities, and supposed variations probably result more from the demands of commerce than through a natural modification.

In studying the history of a plant it would seem the proper course should be to endeavor to first trace its traditional description and uses and to then harmonize these with modern scientific facts. Unfortunately in the case of Coca, the earlier records have been largely ignored through prejudice, the descriptions which have been presented to the scientific world having often been the arbitrary outcroppings of convenience based upon the writings of travellers through certain localities, while the conclusions drawn from these accounts have been of a generalizing nature. It seems only necessary to suggest this possible source of error to show how readily confusion may be engendered.

It is always difficult to determine whether a plant, apparently growing wild, is a representative indigenous species which has existed from an early period or has been introduced from some distant locality. The scattering of seeds, by the winds, or birds, as well as by other unconscious means, may be one source of distribution of a plant through a wide region, though as a rule the abode of each species may be regarded as nearly constant. One of the strongest evidences of the antiquity of a plant in its native home is the finding of its fossil remains. While we have no such record in the history of Coca, we have innumerable examples of Coca leaves found in relics and with mummies of great antiquity, which indicate in the strongest possible way that Coca has been indigenous to Peru through many hundreds of years.

Through the courtesy of the Curator of the Department of Peruvian Antiquities at the American Museum of Natural History, I obtained a specimen of very ancient Coca leaves, together with a little bag of llipta, all of which was contained in a chuspa of the ordinary Incan order. These had been taken from a mummy pack found in a tomb at Arica. This mummy wore a cap shaped like a Turkish fez, woven of coarse wool in unique design, over which was a covering of feathers, surmounted with a green tassel-like feather, making a very imposing head dress and indicating that the subject had been a person of rank. One hand bore a white flint knife, with a handle made by binding cloth about one end of the flint.

In the pack with the mummy, which had every evidence of extreme antiquity, was a papal bull dated 1571. Allowing some twenty years

for this document to have found its way to Peru, this would make the mummy over three hundred years old. That this was so, may be inferred from the fact that no other European object was found in the pack, everything being of an aboriginal order before the influence of the Conquest had been manifest. The leaves were dry and very brittle and of a light brownish color. The llipta was in soft yellow lumps. A reproduction of these leaves proves them to be of the variety which we to-day understand as Truxillo or Peruvian Coca. They vary in size from a half inch in length to pieces showing a probable length of some three inches. They all plainly show the peculiar characteristic markings of Coca, the lateral lines being well made out. Unfortunately this mummy pack had been treated with antiseptics before it was opened, which rendered it impossible to note the taste of the leaves, and there was not sufficient of them to attempt an assay.

In a choice collection of leaves from the district of Caravaya I have found every variety of leaf present, the pronounced obovate, the long narrow leaf, the leaf with the little point extending as though a continuation of the inner leaf, and the distinctly lanceolate, so that it is quite probable that more than one variety of Coca is grown in one plantation.

The Coca which comes to the markets of the commercial world is broadly grouped in two varieties, the Bolivian or Huanuco and the Peruvian or Truxillo variety, the characteristic difference between the two varieties being that the Bolivian leaf is thick, dark green colored above and yellowish beneath, while the Peruvian leaf is smaller, more delicate, lighter color and grayish beneath. Manufacturers of cocaine use practically nothing except the Bolivian or Huanuco Coca, which contains the highest percentage of cocaine and the least quantity of associate alkaloids, which cocaine manufacturers have regarded as "objectionable" because they will not crystallize. While medicinally the Coca yielding a combination of alkaloids is preferred, the two varieties of leaf are entirely distinct as to flavor, being more pronouncedly bitter in proportion to the relative amount of cocaine present.

Botanists have endeavored to still further divide the commercial varieties of Coca because of certain peculiarities of the leaf. Some years ago Mr. Morris, of Kew, in describing the Truxillo variety of Peruvian Coca, named it *Novo Granatense*, because it was presumably a native of New Grenada. Shortly after Dr. Burck, of Buitenzorg, Java, described the variety collected by Dr. Spruce on the banks of the Rio Negro, which he named after its discoverer, *E. Spruceanum*. He also described a variety of Huanuco Coca which he considered approached the classic type of Lamarck, and named it *Erythroxylon Bolivianum*. Thus we have Peruvian or Truxillo Coca, variety *Novo Granatense*,

Morris, and Bolivian or Huanuco Coca, which is identical with *Erythroxylon Bolivianum,* Burck.

The shape of the Coca leaf is a question which has excited considerable discussion among botanists, who have regarded as striking characteristics details which are seemingly unimportant to the casual observer. Undoubtedly much of the early confusion in attempts at classifying Coca from the accounts of travellers and writers has arisen from unscientific description. The illustrations have often been carelessly drawn, and this pictorial difference has represented technical faults of the illustrator rather than any actual variation of the leaf itself. In many instances the characteristics of Coca have not been clearly indicated. The result has been to confuse those seeking details.

As a matter of fact, there is considerable variation in size and shape of the Coca leaf, a variation not due to the fact that the leaves have been collected from several varieties of Coca or even from several different shrubs, but upon one Coca plant there may be found leaves of varying form and size.

The Coca collected by Jussieu was from the Yungas of Bolivia, while the bulk of Coca used by the Andeans is grown in Peru. It is the plant used by these Indians, the properties of which have been exalted from the time of the Incas, to which all the traditions of Coca are attached, and really one would be more justified in saying that the specimens sent by Jussieu from Bolivia were a modification of the historical Incan plant than to say that the Peruvian grown species is a variation. The Indians prefer Peruvian Coca, and but for the importance to Bolivian Coca through cocaine less of the latter variety would be grown. Any attempt to describe Coca as a whole from any one variety, it will be seen, must be confusional, Bolivian Coca being rich in cocaine, while Peruvian Coca is richer in aromatic alkaloids. This variation is still maintained in the plants grown artificially at Paris and in the East.

Plants and seeds of several varieties of Coca have been distributed to the botanical gardens of the English colonies at Demerara, Ceylon, Darjeeling, and Alipore, where they are cultivated in a commercial way and where they have been carefully studied under the new conditions of environment. Having in mind the history of cinchona, which had been taken from its native home in the montaña of Peru and so successfully cultivated in the East, it seems a natural inference that Coca may also be grown scientifically under similar facilities where the possibility for distribution would be superior to the crude Andean methods. Certain parts of Java are particularly suggestive of the Coca region of Peru. The country is traversed by two chains of mountains which are volcanic, and, as in the Andean region, the vegetation varies with the altitude. From the seaboard to an elevation of 2,000 feet the

growth is of a tropical nature, and rice, cotton and spices abound. Above this to 4,500 feet coffee, tea and sugar are raised, while still higher, to 7,500 feet, only the plants of a temperate region can be grown.

There are many details essential in the cultivation of tea and coffee which suggest similar necessities in the cultivation of Coca. In Ceylon the best coffee is grown from 3,000 to 4,500 feet above the sea, where rain is frequent and the temperature moderate, and, like Coca, the higher the altitude in which the shrub can be cutivated without frost, the better is the quality of the product. Although the yield may be less, the aromatic principles are more abundant and finer than that produced in the lowlands. Similar hilly ground where there is good drainage is best adapted for the growth of tea. The shrubs do not yield leaves fit for picking before the third year, the produce increasing yearly until the tenth year. The yield from the tea plant is about the same as that from Coca, but the young leaves of tea are usually gathered, while only the matured leaves of Coca are picked.

The climate, the environment, the method of cultivation and even the uses all seem paralleled in tea, coffee and Coca, but the benefits of application are immensely in favor of Coca. Tea and coffee were introduced into Europe in the sixteenth century, about the period when we have the first historical record of Coca. They were not then popular beverages as now, and it was only after much prejudice had been overcome that they were considered necessary. As the properties of Coca become better appreciated there is every reason to suppose this substance will come into as general use in every household as a stimulant—rendering a clear head instead of the hot and congested one so apt to follow the use of coffee or tea—Coca does not impair the stomach, while it possesses the added advantage of freeing the circulation from impurities instead of, like tea and coffee, adding additional waste products to the blood stream, as has been suggested by Morton [148] and by Haig.[149]

For native consumption Coca is often packed in small lots sufficient to last one user about a month. Some of these packages are given various geometrical shapes and are covered with weavings of varicolored wicker and cords so artistically, that the wrappings are sought as ornaments to hang in the houses after the Coca has been consumed.

The chief places for the shipment of Coca are Salaverry—the port of Truxillo in the north, and Mollendo—the terminus of the railroad from the Titicaca region in the south.

148. Morton, 1879.

149. Haig, 1897.

There are two varieties of leaf coming to the North American market: the Huanuco—or large leaf, sometimes referred to as the Bolivian Coca, and the Truxillo—or narrow leaf, known as Peruvian Coca. In selecting a leaf the several manufacturers with whom I have corresponded have assured me that they base their choice upon the assay and yield of cocaine. For this reason the Huanuco leaf is the variety commonly found in the market, as it contains a larger amount of cocaine than the Truxillo leaf, which is considered less profitable because of its lower yield of this alkaloid. The native user, however, does not select the *hatun-yunca*—or large leaf Coca, his choice never being influenced by the amount of cocaine presumably present in the leaf chosen. Locally the distinction is made between *hojas dulces*—the sweet leaf, and *hojas amargas*—the bitter leaf, the amount of cocaine present occasioning the bitter quality, while a combination of aromatic principles renders the leaf of more desirable flavor. These principles, though commonly asserted to be exceedingly volatile, are still found in well preserved exported leaves.

The physiological accounts hitherto published of the action of Coca are often confusional because this distinction in the variety of leaf has not been considered, while many experimenters have contented themselves with enumerating the physiological effects of cocaine rather than that of Coca. In this connection Dr. Rusby says: "In my article [150] I took account of the Bolivian Coca only, which is practically the same as the Peruvian, or Huanuco variety, which is the one used for the manufacture of cocaine. As the leaves are found here in the dried state, their properties are, I believe, almost wholly due to the presence of cocaine, quite different from the properties of the fresh, or very recently dried leaves. There is another variety of Coca differing from the Huanuco variety, known as Truxillo leaves, the properties of which as found in this market differ from the Huanuco leaves, while more nearly resembling them in their fresh or recently dried state and as used in the Andes by the natives. You will thus see that all your labors in the direction of physiological research are likely to be fruitless, unless you will be able to ascertain in each case which variety of leaf was used by the one making the report. This I believe to be wholly impossible. Ninety-nine per cent of our physicians scarcely know that there are two varieties, or at least that the varieties differ in any way medicinally. The endeavor has been to prevent physicians from learning facts concerning drugs. It is not likely that they can learn from the pharmacist which leaf he used at any particular time, for various reasons." [151] The biased effort, therefore, to misjudge prep-

150. *Coca at Home and Abroad.*

151. *Person. com.;* 1898.

arations of Coca because they are not rich in cocaine is but an outgrowth of imperfect knowledge, for the unique quality of the Coca leaf is not solely dependent upon the presence of that alkaloid. It is as Dr. Squibb long since asserted from an intimate study of the qualities of Coca: "But as there is undoubtedly a value to Coca which is not measured by the yield of alkaloid, the proportion of alkaloid does not disprove the alleged inferiority." [152]

Thus it will be seen that the Coca leaf as used among the Indians of Peru is one thing, and the variety exported because of its large alkaloidal percentage of cocaine is wholly another matter. This is a distinction which any lover of tobacco will readily appreciate, for surely a fine cigar is never estimated by the amount of nicotine which it contains, nor is the flavor or quality of a delicate tea measured by its percentage of theine. We are beginning to learn Coca more intimately and even the more casual observer may soon realize that there is a very wide interim between Coca absolutely inert, as Dowdeswell long since would have had us believe; "With less vigor than a whiff of mountain air or a draught of spring water," and the extreme potency which the whole world now recognizes in the alkaloid cocaine.

As in all other details of this research, a variety of expression has been given as to the odor and appearance of the Coca leaf. Doubtless this diversity is due to whether new or old leaves have been examined, or whether the leaves have been suitably dried. Poeppig thought one of the constituents of the leaves was volatilized by drying, and it is known that the characteristic aroma of the leaf is lost when it is improperly kept. The aroma of Coca has been compared to that of about every other thing under the sun, and in one case is actually described as having an odor between hay and chocolate.[153] One can appreciate that it is exceedingly difficult to describe an odor, as the nearest approach to exactitude which may be made is by way of comparison. When it is realized how few people can accurately define the tone from a blending of colors, and when it is considered how much more subtle is the correct perception and interpretation of odors, the difficulty of accurate description may be well understood. Perfumery is an art in which there is a very wide range for expresssion, which is not only dependent upon the integrity of the observer's sense of perception, but influenced by the temperament of the describer. A freshly opened bale of properly dried and well preserved Coca has a peculiarly aromatic odor, faintly like vanilla or perhaps suggestive of a finely blended China tea, though more delicate. It has, however, a distinct

152. *Ephemeris;* May, 1880.

153. Bentley and Trimen; 1880.

aroma—the Coca odor *sui generis,* which once learned can always be readily detected and must afford a means for immediate recognition of true Coca preparations as distinguished from spurious combinations made with cocaine or from poor leaves. The Indians select the leaf from its characteristic odor alone, without necessitating even a tasting. This delicacy is only to be preserved by a proper drying and curing, to which end it is considered requisite that the layers of leaves in drying shall be so arranged that the exposure may be uniform to all parts.

It has been advanced by some writers that the constituents of the Coca leaf are so very volatile that deterioration takes place almost as soon as the leaf has been picked. The Peruvian Indians, however, consider that the leaves may be preserved in their integrity, even in the warm and humid localities where they are gathered, for about a year, and in cooler situations for a much longer time. It has been shown by numerous experimenters that the leaf does not become wholly inert when properly cured and preserved with care, even after several years. The leaves examined by Gosse were "the ordinary leaves of commerce, which, though three or four years old, were still greenish and spongy, and possessed characteristic properties." Shuttleworth experimented with leaves which had been in his possession for "eight years and yet were still intact." Christison used leaves for his physiological experiments which he considered were "at least seven years old," yet because they had been well dried they were still green, flat and unbroken, were bitter to the taste and full of aroma. It may be inferred from these accounts that it is quite possible to preserve Coca leaves in a sound condition for several years if proper precautions have been taken in curing, packing and in their subsequent care.

A conservative estimate as to the yield of Coca throughout South America under an average crop would be from thirty million to forty million pounds per annum, almost this entire quantity being consumed in the countries where it is grown. As a rule, the planters contract with the merchants in town for their whole product, but there is also a retail trade carried on with the country people. Every little Indian village has a fair to its patron saint, and at these there is an interchange of Coca, potatoes, maize and woolen cloths, which may again be sold at a considerable profit. There is possibly left for exportation from one million to one million five hundred thousand pounds of leaves, the value of which varies in accordance with the demand and facilities for transportation.

During the period of 1885–1886, when the newness of cocaine created such an exorbitant price for that alkaloid, Coca was held at thirty-five cents a pound on shipboard at Peruvian ports. Two years ago the

leaves were quoted at seven cents a pound at Sandia, while at Asalaya, below Sandia, it was seven pesos and a half, and at Valle Grande two days farther in the montaña it was four pesos the cesta—a peso being eighty Peruvian cents at present equal to about thirty-six cents in United States coin. This would make the price of Coca about eleven cents and six cents respectively, varying with the district and subject to fluctuation according to the means of transit. The recent increase of demand for copper has so taxed the means for transportation that the llamas which were ordinarily used for carrying Coca leaves have been pressed into service for carrying copper ore, the result of which has been to advance the price of Coca on the Peruvian coast to twenty cents. Advices from Lima, dated January, 1900, stated that Coca leaves were then held there at twenty-four cents per pound in large lots.

With the recognition of a volatile principle in the Coca leaf, the proposition was made to solder the packages up in tins like China tea, but this has never been found practicable; in fact, it would be a serious problem to determine the arrangement for carrying such a package, as it should be recalled that the montaña is hundreds of miles from the coast, to which Coca can only be conveyed on the backs of mules or llamas in the most primitive way over rugged mountains and through lofty passes, where travel is exceedingly difficult.

THE PRODUCTS OF THE COCA LEAF

Of all the problems in the study of Coca the search for the force producing qualities of the leaf is the most profound. Science, ever alert to trace with exactitude the secrets of Nature, has struggled in vain to isolate and explain this hidden source of energy. But so cleverly are the atoms associated which go to build up the molecules of power in this marvelous leaf, that though the chemist through the delicacy of analysis has from time to time placed these atoms in differing groups and thus often given to the world some new combination, the one sought element of pent up endurance inherent in Coca has remained concealed. It is like the secret of life—though known to be broadly dependent upon certain principles which may readily be explained, the knowledge of the one essential element remains as great a secret as before research began.

Though all the accounts of travellers had directed attention to the peculiar qualities of Coca in sustaining strength, at the period when the first knowledge of this leaf reached Europe chemistry was not sufficiently advanced to admit of an exact analysis of plant life. Indeed, science met with little encouragement when the great powers were engrossed in political preferment, and it was not until the latter part of the eighteenth century that an impetus seemed given to research after Lavoisier had laid the foundation for modern chemistry. Though he lost his life on the guillotine through the whirligig of political fate during the French Revolution, just as he was at the height of his labors, a new interest was established and the work of the French chemists became active.

Humboldt was then making his extensive explorations through South America, collecting data which was to serve as a basis of research during many subsequent years. Cuvier, the anatomist, was advancing his theories on the classification of animals; Fraunhofer had established a means for studying the heavenly bodies through the spectrum, while chemical electricity had progressed from the experiments of Volta to the electro magnet of Ampère.

The method for expressing chemical equations, such as are now shown by those symbolic letters and figures which appear to the uninitiated as so many hieroglyphics, was not understood until Dalton,

in 1808; had perfected his law of proportions. This was an important advance in chemical knowledge, for from it was built up the sign language which in a chemical formula expresses not only the symbol of each element, but tells the chemist the relative proportion of the combining atoms.

Boerhaave may be said to have been the father of the present system of organic chemistry in the early part of the eighteenth century. So important were his teachings held that his works were translated into most modern languages. Although his attempts at analysis of living things attracted a wide interest, they could be in no manner exact, because the fundamental elements entering into the composition of all organic structure—carbon, hydrogen, oxygen and nitrogen—had not then been determined. Yet so skilled were his observations, even under limited opportunities, that many of his conclusions have not since been refuted in the light of improved methods. Perhaps the earliest hint upon alkaloids was that made by this scientist when he referred to the bitter principle in the juices from chewing Coca as yielding "vital strength" and a "veritable nutritive." [154]

It was reserved for Liebig some hundred years later to perfect the science of living structures, and to show there was not that exact separation between the chemistry of the organic and inorganic world that had previously been supposed. Following the teachings of this master mind, many compounds were constructed in the laboratory synthetically, and urea was thus produced in 1828 by Woehler, whose name is associated with the early investigators upon cocaine. Research upon the chemistry of organic bodies was now active. In England the work of Davy upon soils and crops, and the investigations of Darwin, unfolded in his theory of the origin of species, gave a new meaning to the study of organic life.

It was but a natural outcome of this spirit for research that turned the attention of explorers to South America, which had remained practically a new world since its discovery. Here were to be found innumerable strange plants indigenous to a country where everything was marvelous when viewed with the comparative light of the older world. In the height of this interest, the suggestive hints of naturalists and travellers were incentives to further the investigations of the European chemists. The writings of Cieza, Monardes, Acosta, Garcilasso and a host of others upon the wonderful qualities of the Coca leaf stimulated a desire to solve its tradition of ages and prove its qualities by the test of science.

It is surprising to now look back over three centuries and recall

154. Boerhaave; ¶ 68; 1708.

these early authors, to consider under what conditions they wrote, and to read with what enthusiasm and exactness they give expression to the knowledge they had gained from an observation of the novel customs about them. Thus the Jesuit father, Blas Valera, speaking of the hidden energy of Coca, wrote: "It may be gathered how powerful the *Cuca* is in its effect on the laborer, from the fact that the Indians who use it become stronger and much more satisfied and work all day without eating." [155]

It was not until after Coca had been botanically described by Jussieu, and classified by Lamarck, that its chemical investigation approached thoroughness. The researches of Bergmann and Black upon "fixed air"—as carbonic acid was then termed, the discovery of hydrogen by Cavendish, of nitrogen by Rutherford and of oxygen by Priestley, each following upon the other in quick succession in the latter half of the eighteenth century, displayed the great activity of chemistry at that period. Although no result was then arrived at in the investigations upon Coca, the spirit of the time was eminently toward exactitude, and this was displayed in many endeavors to trace to a chemical principle the potency of the Coca leaf.

Attention was very naturally directed to the method in which Coca was used, and the *llipta* which was employed with the leaves in chewing was looked upon as having some decided influence. Dr. Unanue, who has written much concerning the customs of the Indians, was one of the first to suggest that possibly this alkaline addition to the leaf developed some new property to which the qualities of Coca might be attributed,[156] while Humboldt, as elsewhere referred to, through an error of observation considered this added lime as the supposed property of endurance.

Stevenson, in 1825, described the action of the *llipta* as altering the insipid taste of the leaves so as to render them sweet, and in 1827 Poeppig expressed the opinion that there was a volatile constituent in the Coca leaf which exposure to the air completely destroys.

Attention had now been directed to the isolation of alkaloids from plants, and during the first quarter of the nineteenth century several active principles were thus obtained and the possibility of tracing the hidden properties of Coca through analysis was suggested. Von Tschudi, when engaged in his extended explorations through Peru, became so impressed with the qualities of Coca that he advised Mr. Pizzi, Director of the Laboratory *Botica y Drogueria Boliviana,* at La Paz, to examine the leaves, which resulted in the discovery of a

155. Garcilasso; Vol. II, p. 371; 1871.

156. Unanue; 1794.

supposed alkaloid, but when on his return to Germany this body was shown to Woehler, it was found to be merely plaster of paris, the result of some careless manipulation.

Dr. Weddell, in 1850, after a prolonged personal experience in the Andes with the sustaining effects of Coca, pronounced it as yielding a stimulant action differing from that of all other excitants. This influence both he and other observers supposed might be due to the presence of theine, the active principle of tea, which had shortly before been discovered, and was then exciting considerable discussion. With this idea in view, Coca leaves were examined, and, though this substance was not found, there was obtained a peculiar body, soluble in alcohol, insoluble in ether, very bitter, and incapable of crystallization, and a tannin was obtained to which was attributed the virtues of Coca.[157]

About this same period there was found in the leaves a peculiar volatile resinous matter of powerful odor,[158] and two years later, from a distillation of the dry residue of an aqueous extract of Coca, an oily liquor of a smoky odor was separated together with a sublimate of small needle-like crystals, which was named "Erythroxyline," [159] after the family of which Coca is a species.[160] So each new investigator made a little progress, and in 1857 positive results were very nearly reached through the following process: An extract of Coca was made with acidulated alcohol, the alcohol was expelled, and the solution rendered alkaline by carbonate of soda. Upon extracting this with ether, an oily body of alkaline reaction was obtained without bitter taste, which on application to the tongue produced a slight numbness. The reaction of platinum chloride yielded with the acid solution a yellowish precipitate, soluble in water. From a distillate of the leaves with alkali there was remarked a disagreeable, strongly ammoniacal odor.[161] Subsequently a peculiar bitter principle, extractive and chlorophyl, a substance presumed to be analogous to theine, and a slat of lime was found.[162]

These negative findings led some to assert that Coca was inert and its properties legendary, but more careful observation has shown the

157. Wackenroder; July, 1853.

158. Johnston; 1853.

159. Gaedcke; 1855.

160. It is claimed that Dr. S. R. Percy read a paper before the New York Academy of Medicine in November, 1857, upon an alkaloid of Coca which he had obtained and then independently named "Erythroxyline."

161. Maclagan; 1857.

162. Stanislas Martin; 1859.

true difficulty was an inability to secure appropriately preserved leaves for examination. This was made evident through an essay upon Coca by an eminent Italian neurologist, from experiences while a resident of Peru, when a host of physiological evidence emphasized the powerful nature of Coca, wholly apart from any mere delusions of fancy or superstition.[163] The weight of facts presented proved sufficiently forcible not only to stimulate the waning spirit for scientific inquiry, but to awaken a widespread popular regard in what was now generally accepted as a plant of phenomenal nature.

In the height of this interest Dr. Scherzer, who accompanied the Austrian frigate Novara on the expedition to South America, opportunely brought home specimens of Coca leaves from Peru. These were sent to Professor Woehler of Gottingen for analysis, who entrusted their examination to his assistant, Dr. Albert Niemann, who is regarded as the discoverer of the alkaloid cocaine. Thus this chemist entered upon the investigation of Coca not in any mere accidental way, but with an understanding of the seriousness of his research and its probable importance.

Niemann exhausted coarsely ground Coca leaves with eighty-five per cent alcohol containing one-fiftieth of sulphuric acid; the percolate was treated with milk of lime and neutralized by sulphuric acid. The alcohol was then recovered by distillation, leaving a syrupy mass, from which resin was separated by water. The liquid then treated by carbonate of soda to precipitate alkaloid emitted an odor reminding of nicotine, and deposited a substance which was extracted by repeatedly shaking with ether, in which it was dissolved, and from which the ether was recovered by distillation. There was found an alkaloid present in proportion of about one-quarter of one per cent, which was named *"Cocaine,"* after the parent plant. Mechanically mixed with its crystals there was a yellowish brown matter of disagreeable narcotic odor, which could not be removed with animal charcoal or recrystallization, and was only separated by repeated washings with alcohol.

Pure cocaine, as described by this investigator, is in colorless transparent prisms, inodorous, soluble in seven hundred and four parts of water at 12° C. (53.6° F.), more readily soluble in alcohol, and freely so in ether. Its solutions have an alkaline reaction, a bitter taste, promote the flow of saliva and leave a peculiar numbness, followed by a sense of cold when applied to the tongue. At 98° C. (208.4° F.) the crystals fuse and congeal again, into a transparent mass, from which crystals gradually form. Heated above the fusing point, the body is

163. Mantegazza; 1859.

discolored and decomposes, running up the sides of the vessel. When fused upon platinum the crystals burn with a bright flame, leaving a charcoal which burns with difficulty. The alkaloid is readily soluble in all dilute acids forming salts of a more bitter taste than the uncombined cocaine. It absorbs hydrochloric acid gas, fuses and congeals to a grayish white transparent mass which crystallizes after some days. The crystals from its solution are long, tender and radiating.

Besides cocaine, there was found in the alcoholic tincture precipitated by milk of lime a snowy white granular mass. This fused at 70° C. (158° F.), was slowly soluble in hot alcohol, more readily so in ether, and was not acted on by solutions of acids or alkalies. This substance was named *Coca wax* and given the empirical formula $C_{66}H_{66}O_4$.

Upon distilling one hundred grammes of leaves, a slightly turbid distillate was obtained, which when redistilled with chloride of sodium, yielded white globular masses lighter than water and having the peculiar tea-like odor of Coca.

In the dark red filtrate from which the cocaine had been precipitated by carbonate of soda there was found after suitable treatment a *Coca tannic acid,* to which the formula $C_{14}H_{18}O_8$ has been given.[164] This latter result, it will be remembered, was as far as Wackenroder's investigations had gone in 1853.

The atomic weight of the amorphous compound determined from the double salt with chloride of gold, was found to equal 283, and when crystallized from hot water 280, or from alcohol 288. On heating this double salt benzoic acid was sublimed from it, which was recorded as the first observation of this nature from any known alkaloid.[165]

Following this research, the late Professor John M. Maisch of Philadelphia verified the several results. The small percentage of nitrogen announced in the original formula suggested that possibly cocaine was a decomposition compound, while the nicotine odor was thought to result from a nitrogenous body or another alkaloid. To determine this, the liquor and precipitate which had been obtained by carbonate of soda were distilled over a sand bath. A syrupy liquid was left, from which the alkaloid was separated by ether, while from the distillate was collected a resin-like mass of an acrid taste, having a narcotic odor, soon lost on exposure to a damp atmosphere, while the mass became acid and was now rendered easily soluble in water

164. Watts; 1889.

165. Niemann; 1860.

and alcohol. Whether or not this principle was nitrogenous this investigator left undecided.[166]

Continuing the same line of research as that of Niemann, and following the suggestions of Maisch, William Lossen[167] of Gottingen carried out an extended inquiry as to the nature of cocaine, and established its formula $C_{17}H_{21}NO_4$, in accordance with the new notation. In examining its composition he found by heating it with hydrochloric acid that it was split up into benzoic acid and another body, thereby confirming the observation which had been made concerning this sublimation from the double salt of chloride of gold and cocaine. This new base he named "*ecgonine*," from εχγονος—son or descendant.

The breaking down of cocaine was subsequently shown due to hydration, by saponifying it with baryta, and also with water alone. The first change being into benzoyl-ecgonine, followed by a sublimation of benzoic acid, while from the syrupy residue the ecgonine may be separated by repeated washings with alcohol and precipitation with ether. The crystals being only dried with great difficulty.

Ecgonine, $C_9H_{15}NO_3$, crystallizes over sulphuric acid in sheaves. It has a slight bitter-sweet taste, is readily soluble in water, less so in absolute alcohol, and insoluble in ether. Heated to 198°, it melts, decomposes and becomes brown. It forms salts with the acids, most of which crystallize with difficulty. With alkalies, it forms crystallizable combinations soluble in water and alcohol. In aqueous solutions the hydrochloride yields no precipitate with alkalies. Chloride of platinum in presence of much alcohol gives an orange yellow precipitate, chloride of mercury throwing down a yellow precipitate under the same conditions.

The unstable nature of cocaine in the presence of acids has suggested their avoidance in its preparation, plain water being considered preferable. In this process Coca leaves are digested several times at 140° to 176°, the infusions united, precipitated by acetate of lead, and filtered. The lead is removed by the addition of sulphate of soda, and the liquor concentrated in a water bath. Carbonate of soda is then added, and the whole shaken with ether to dissolve the alkaloid, when the ether may be recovered by distillation.

In his researches Lossen[168] also described the liquid alkaloid that had been hinted at by Gaedcke in 1855, and subsequently noticed by

166. Maisch; 1861.

167. Lossen; Juin, 1861.

168. Lossen; CXXXII, 351; 1865.

Niemann and Maisch, which, at the suggestion of Woehler,[169] who was associated in this investigation, was termed *"hygrine,"* from *υγρος*—liquid, to which the formula $C_{12}H_{13}N$ was given. This was obtained by saturating the slightly alkaline mother liquor from which cocaine had been extracted with carbonate of soda and repeatedly washing with ether. Evaporation of the ethereal extract left a thick yellow oil of high boiling point with a strong alkaline reaction. Hygrine thus found is described as very volatile, distilling alone between 140° and 230° F. It is slightly soluble in water, and more readily so in alcohol, chloroform and ether, not in caustic soda, but readily in dilute hydrochloric acid. Its taste is burning and it has a peculiar odor similar to trimethylamine or quinoline. The oxalate and muriate are crystallizable, but very deliquescent.

With chloride of platinum, hygrine gives a flocculent amorphous precipitate which decomposes on heating. Bichloride of mercury gives an opalescence, due to the formation of minute oily drops.

Thus far there had been found in Coca leaves a crystallizable compound of unstable composition—cocaine; a second base which was only to be crystallized with difficulty—ecgonine; an intermediate compound—benzoyl-ecgonine; and an oily volatile liquid of peculiar odor —hygrine; together with Coca-tannic acid, and a wax-like body. Meantime, considerable was done in a physiological way in experimenting with the new alkaloids, though little decided progress was made during the following twenty years, until 1884, when the use of cocaine in local anaesthesia was announced. The importance of this application occasioned an increased activity of investigation regarding the Coca products. This interest tended to make our knowledge of the alkaloids more exact, as well as to enrich our understanding of those inherent sustaining properties of Coca which have for past ages excited wonder.

In the early days of the cocaine industry some manufacturers asserted that the several associate substances found in Coca leaves were decomposition products, developed by changes taking place in deteriorating leaves or arising during the process of obtaining the one alkaloid. The great demand for cocaine and the high price it commanded generated an apparent unwillingness on the part of manufacturers to admit the possible presence in Coca of any other principle than cocaine. Processes innumerable were devised to force the greatest yield of alkaloid from the leaves and some of the earlier specimens of the salt placed upon the market were more or less an uncertain mixture, dirty white in color and having a nicotine-like

169. Woehler und Lossen; CXXI, 372; 1860.

odor. This was defended as a peculiarity of the substance, the therapeutic action of which was asserted to be identical with cocaine, even though the appearance was not so elegant as the purer crystals. An endeavor to purify the salt by studying its sources of decomposition resulted in the separation of several important alkaloids.

The intermediate base *benzoyl-ecgonine,* $C_{16}H_{19}NO_4$, was described as a by-product of the manufacture of cocaine,[170] and, it has been shown, may be also obtained by the evaporation of cocaine solutions.[171] It has been prepared by heating cocaine with from ten to twenty parts of water in a sealed tube at 90° to 95° C., with occasional shaking until a clear solution is obtained. This is extracted with ether to remove all traces of undecomposed cocaine, and then concentrated on a water bath and crystallized over sulphuric acid. The crystals form as opaque prisms or needles, sparingly soluble in cold water, more readily so in hot water, acids, alkalies and alcohol, while insoluble in ether. It melts at 90° C., then solidifies, and again melts at about 192° C. The taste is bitter, its solutions are slightly acid, becoming neutral after recrystallization. The hydrochloride, at first of a syrupy consistency, forms tabular crystals which are freely soluble in absolute alcohol. Mayer's reagent produces a white, curdy precipitate; iodine in potassium iodide, a kermes brown precipitate; chloride of gold, a bright yellow precipitate, soluble in warm water and alcohol.

It will be recalled that Maclagan, Niemann and Maisch had each alluded to an uncrystallizable residue in their processes of extraction, and an effort was made to definitely determine its true quality. But just as cocaine was at first regarded as the only alkaloid, so this amorphous substance was studied as a whole instead of being regarded as a mixture of bases. Coca leaves, it was asserted, contained a crystallizable cocaine and an uncrystallizable cocaine. The latter product has been named *cocaicine,*[172] *cocainoidine* [173] and *cocamine,*[174] and is still the subject of investigation.

The relative amount of this non-crystallizable body left in the mother liquor after the precipitation of cocaine varies greatly and is wholly dependent upon the kind of leaves used, or the processes to which they are subjected. The color of various specimens varies from dark yellow to dark brown, while the consistence is from that of a syrupy liquid to a sticky, tenacious solid, which, after spontaneous

170. W. Merck; 1885.

171. Paul; Oct. 17, 1885; March 27, 1886.

172. Bender; 1886.

173. Lyons.

174. Hesse.

evaporation, may form short, fine crystals. The odor, while recalling nicotine, is more aromatic and less pungent; the taste bitter and aromatic. This body is of alkaline reaction, soluble in alcohol, ether, benzole, chloroform, petroleum ether, acetic acid, etc., and of varying solubility in water, according to its consistence. On gently heating it becomes quite fluid. It is very soluble in dilute acids, with which it forms non-crystalline salts, all of which dissolve readily in water. Dissolved in rectified spirit and treated with animal charcoal or acetate of lead, to precipitate the coloring matter, a pale yellow, sticky, non-crystalline body is obtained, which will not form crystals, even after standing for months. Solutions of the substance in alcohol, repeatedly precipitated by ammonia, yield a nearly white non-crystalline flocculent body, which is very hygroscopic, the original odor and taste remaining, no matter how often the purifying process is repeated.[175] Evaporated at gentle heat, the solutions darken, and if evaporated to dryness the substance becomes insoluble in water. The precipitation with permanganate of potash is brownish, which, on heating, yields an odor of bitter almonds; 5 c.c. of a solution 1-1000 reduces 20 to 40 drops of a permanganate solution of the same strength.

Professor Stockman, of Edinburgh, made an interesting study of these mixed bases, which he originally supposed to be a solution of ordinary crystalline cocaine in hygrine, basing his conclusions on the physiological action and chemical relations. As he stated, cocaine is extremely soluble in hygrine, and once solution has occurred it is practically impossible to separate the two bodies, as they are both soluble in the same menstrua and are both precipitated by the same reagents. This is also the case with the salts of these bodies, though not to the same extent, the presence of hygrine rendering any such samples of the salt hygroscopic, as well as imparting the peculiar nicotine-like odor of hygrine. Subsequent investigation, however, has convinced this physiologist that the substance he experimented with was cocamine dissolved in hygrine, together with some benzoyl-ecgonine.[176]

Thus it will be seen that the earlier conclusions regarding the Coca products were erroneous from imperfect knowledge. With the increasing usefulness of cocaine this confusion is a serious matter, because these mis-statements of the chemists and physiologists are often still quoted as authoritative. So positive were some of these earlier opinions that even after physiological proof showed the unmistakable presence of associate alkaloids with cocaine they were asserted, from

175. Stockman; 1887.

176. Stockman; *person. com.*, 1899.

interested motives, to be poisonous contaminations. In the face of this the result of physiological experimentation with the various Coca bases indicate that they are all more mild than cocaine, from which they differ markedly in physiological action. Dr. Bignon, Professor of Chemistry at the University of Lima, Peru, who from position and opportunities may be regarded as a competent authority upon Coca, long since asserted, when grouping the alkaloids of Coca in two classes, that the crystalline body is inodorous, while the non-crystalline has a peculiar odor and is weaker in action and less poisonous than the crystallizable cocaine.

The wholly different action of cocaine therapeutically from the Coca leaves of the Andean, or the more exact scientific preservations of Coca such as exhibited in the preparations of M. Mariani—which fully represents the action of recent Peruvian Coca, clearly indicates the presence of certain important principles in Coca, the properties of which are sufficiently distinct to markedly affect physiological action in a manner different from any one of its alkaloids. Happily we are now learning more definitely through research and experimentation, and these earlier errors are being corrected.

The diametrically opposite findings of investigators of known repute indicate that these inharmonious conclusions were not wholly the result of carelessness nor prejudice. Just as Coca experimented with by one observer repeated the traditional influence, or in some other instance proved inert, so the chemists found the result of their labors at variance. Much of this confusion was cleared away when the botanists explained that there are several varieties of Coca. Those qualities which had formerly been attributed to superstitious belief, or which when reluctantly accepted as possibly present in an extremely fugitive form which was lost through volatility, were shown to be dependent upon the variety as much as upon the quality of the Coca leaf employed in the process of manufacture.

Cocamine was originally studied in the alkaloids obtained from the small leaf variety of Coca by Hesse.[177] It was regarded by Liebermann as identical with a base which he described as *γ-isatropyl-cocaine,* and afterward termed *α truxilline,* because supposedly found only in the Truxillo variety of Coca.[178]

The research leading to these conclusions provoked bitter controversy between these two investigators. It has since been determined that cocamine is of the same empirical composition as cocaine, though weaker in anaesthetic action. It is a natural product of several vari-

177. Hesse; 1887.

178. Liebermann; XXI; 1888.

eties of Coca, particularly of that grown in Java.[179] From hydrolysis by mineral acids cocamine yields *cocaic, iso-cocaic* and *homo-iso-cocaic* acids, while from its isomeride there is formed in a similar way *α-isotropic* or *β-truxillic* acid. Both cocaic and iso-cocaic acids yield cinnamic acid and other products on distillation. Subsequently a similar body was prepared synthetically from ecgonine and cinnamic anhydride, and named *cinnamyl-cocaine.*[180] It forms large colorless crystals, melts at 120°, is almost insoluble in water, and readily soluble in alcohol and ether. This body has been proved to occur naturally in Coca leaves from various sources,[181] being present in some specimens as high as 0.5 per cent.

Thus it will be seen there has been much discussion and uncertainty upon the Coca products, particularly so as to those of an oily nature, originally designated as hygrine and the amorphous substances previously described under various titles.[182]

It is the opinion of Hesse that hygrine is a product of decomposition of one of the Coca bases, and does not occur in fresh Coca leaves; in support of which he asserted that while dilute acid solutions of hygrine have a strongly marked blue florescence which is characteristic, this reaction is not shown when fresh leaves are first operated upon. But as this reaction develops gradually, he inferred that hygrine was formed by the decomposition of amorphous cocaine, from the solution of which it could be separated by ammonia and caustic soda as a colorless oil having the odor of quinoline. In fact, he considered the oil thus obtained a homologue of quinoline, possibly a tri-methyl-quinoline.

Another observer,[183] while experimenting with the alkaloids of Coca by means of their platinum salts, obtained an oily base, exceedingly bitter and differing in odor and solubility from that which had been described by Lossen, but which was presumably identical with the amorphous products, *cocaicine* and *cocainiodine,* and Hesse concluded there might really be two oily bases in amorphous cocaine, one found in the benzoyl compounds of the broad leaf variety and one in the cinnamyl compounds of the *Novo Granatense* variety, in both cases associated with *cocamine* and another base, which he named *cocryl-amine.*[184] Liebermann, on the other hand, considers hygrine a com-

179. Hesse; Aug. 8, 1891.

180. Giesel; 1889.

181. Paul and Cownley; XX, 166; 1889.

182. This uncertainty still persists today.—Eds.

183. Howard; July 23, 1887.

184. Hesse; November, 1887.

bination of two liquid oxygenated bases which may be separated by fractional distillation. One—$C_8H_{15}NO$, an isomeride of tropine, with a boiling point 193° to 195°, the other, $C_{14}H_{24}N_2O$,[185] not distilling under ordinary pressure without decomposition, while still other experimenters from distilling barium ecgonate obtained a volatile oily liquid which strongly resembles hygrine.[186] Merck has shown this body yields, on decomposition, methylamine, from which it has been inferred that it is identical with tropine, and hence closely allied to atropine. With this fact in view it was presumed the dilating property of cocaine upon the pupil was due to hygrine, but this has been proved not to be the case.[187]

The assertion that hygrine is never present in Coca leaves, but is merely a decomposition product in the manufacture of cocaine, lends an added interest to the research of Dr. Rusby upon fresh Coca leaves made while he was at Bolivia. From repeated examinations he found a certain yield of alkaloids, while specimens of the same leaves sent to the United States yielded from treatment by the same process less than half the percentage of alkaloid that he had obtained. This prompted him to search for the possible source of error, and it was found that after all the cocaine was eliminated there was still a decided alkaloidal precipitate. From this it was concluded that: "native Coca leaves contain a body intimately associated with the cocaine and reacting to the same test, which almost wholly disappears from them in transit." [188]

This result indicates the presence in Coca leaves of some extremely volatile principle to which decided physiological properties are attached, which may also be obtained from suitably preserved leaves. When a preparation made from recent leaves in Bolivia was submitted to Professor Remsen, of Johns Hopkins University, his assistant reported that he found a bitter principle, and an oil, which presumably differed in no way from that found at the time of the examinations made in Bolivia. This is comparable with similar findings of those who have experimented with Coca, whether the leaves were recent and examined on the spot, or the examination had been made thousands of miles distant upon well preserved leaves. In each instance similar volatile alkaloids have been obtained, which have commonly been pronounced "decomposition products," yet, as these are always found by careful observers, it indicates they are the natural associate bases of Coca.

185. Liebermann; XXII; 1, 675; 1889.

186. Calmels and Gossin; 1885.

187. Stockman; 1888.

188. Rusby; 1888.

The conclusions are that crude cocaine is not merely a single alkaloid. As the yield of crystallizable cocaine from the crude alkaloid varies from fifty to seventy-five per cent, the associate alkaloids, together with the impurities and contaminations of manufacture, must constitute the remaining twenty-five or fifty per cent of the substance. Though our knowledge of these alkaloids is not yet exact, each of them has been found to possess certain chemical characteristics and sufficient physiological influence to prove a factor in the action of Coca. While these several Coca bases have been experimented with physiologically to a limited extent, they have never been individually applied to therapeutic uses. They have been regarded by the manufacturers of cocaine as simply so much waste from their yield of cocaine, and the attention of chemists has been directed to converting them by some synthetic process to what has been regarded as the pure alkaloid.

In the chemical constitution of cocaine there is a methyl, CH_3, and a benzoyl, $C_6H_5CO_2$, radical, either of which can be replaced by other acid radicals and so give rise to various homologues—or compounds of similar proportions. The methyl radical has been shown to be essential to the anaesthetic action, and its presence or absence in the chemical group constitutes a poisonous or non-poisonous Coca product.[189] By heating the Coca bases with alkyl iodides the corresponding esters are obtained. Thus *methyl-benzoyl-ecgonine*—cocaine; *ethyl-benzoyl-ecgonine*—homococaine; *methyl-cinnamyl-ecgonine*—cinnamyl-cocaine, etc., are formed. Acting upon this data, Merck, by heating benzoyl-ecgonine with a slight excess of methyl-iodide and a small quantity of methylic alcohol to 100° C., evaporating the excess of methyl-iodide and methylic alcohol, obtained a syrupy liquid containing cocaine hydriodate, from which an artificial cocaine was produced. In a similar way Skraup,[190] by heating benzoyl-ecgonine, sodium-methylate and methyl-iodide in a sealed tube, made a synthetic cocaine, although the yield was only about four per cent, while that of Merck was nearly eighty per cent of the theoretical quantity.

In following this process, but using ethyl iodide,[191] Merck obtained a new base, or homologue, *cocethyline,* or *homococaine,* with the formula $C_{18}H_{23}NO_4$, which crystallizes from ether in colorless, radiating prisms, and from alcohol in glossy prisms, which melt at 108°-109° C. The alkaloid is sparingly soluble in alkalies; chloride of gold gives a voluminous yellow precipitate, and chloride of mercury a white,

189. Crum-Brown and Fraser.

190. Skraup; 1885.

191. W. Merck; XVIII; 1885.

pulverulent one, soluble in hot water. Falck has ascertained that coc-ethyline has an anaesthetic action similar to cocaine, though weaker.

In following a similar method, but employing propyl iodide and propyl alcohol, and again by the use of iso-butyl-iodide with its corresponding alcohol, *coc-propyline* and *coc-iso-butyline* have been respectively formed, both of which have a strong anaesthetic action, and, though chemically different, exhibit the same reactions as cocaine.

Ecgonine has been converted into a new base [192] by heating it for twenty-four hours with aqueous potash. This differs from ecgonine by being less soluble in absolute alcohol, in having a higher melting point, and in being dextro-rotary, and hence termed *dextro-ecgonine*. From this there has been prepared synthetically a *dextro-cocaine*, a colorless oil which solidifies and forms crystals on standing which are readily soluble in ether, alcohol, benzine and petroleum spirit. This body resembles cocaine, but its action is more fugitive.

From the ready converson of the various Coca bases experimentally it was but a step to the building up of the associate bases into a synthetic salt of cocaine. This has given rise to a profitable industry, the process for which has been patented in Germany.[193] In this process the mixed bases are converted by hydrolysis to ecgonine, then to a solution of hydrochloride of that salt in methyl alcohol.[194] The hydrochloride of ecgonine methyl-ester is formed, and from this the salt is crystallized and heated over a water bath with benzoyl chloride, the homogenous mass being washed and separated from benzoic acid, and the cocaine precipitated with ammonia and crystallized from alcohol.

The proportion of alkaloids contained in Coca leaves is influenced by the method of the growth of the plant, and the yield is dependent upon the manner of curing the leaves and their preservation. The percentage ranges from a mere trace to about one per cent. Bignon considers that well preserved leaves will yield fully as much as recent leaves, varying from nine to eleven grammes of the mixed alkaloids per kilogram, the latter being more than one per cent. Niemann obtained from his original process 0.25 per cent of cocaine, while the present yield is more than double that. From a number of assays made during the last few years in the laboratory of an American manufacturer [195] the following percentages of alkaloid were obtained: 0.53, 0.51, 0.63, 0.63, 0.57, 0.60, 0.66, 0.55, 0.70, 0.70, 0.65, 0.67, 0.54, 0.70, 0.32, 0.42, 0.52, 0.85, 0.48, 1.3, 0.78, 0.70, 0.40, 0.63. This will serve

192. Einhorn and Marquardt; XXIII; 1890.

193. Liebermann; XXI; 1889.

194. Einhorn; XXI, 3335; 1888.

195. Parke, Davis & Co.; *person. com.;* 1898.

as an index of the quantity of total alkaloid commonly found in the average leaf of good quality as it reaches North America.

In determining the amount of alkaloids present in a given specimen of Coca, it is essential that the selected leaves be finely powdered, and mixed with a suitable menstruum that will not cause undue annoyance from gummy and resinous matters while setting free the essential constituents. These are washed out of the solution by an appropriate solvent, dried and weighed, or estimated by using some reagent the equivalent values of which have been determined by experiment. Various alkalies, as lime, soda or magnesia, have been suggested for admixture with the leaves for the purpose of liberating the alkaloids, which are transformed to soluble salts by acidulated water and washed out with strong alcohol. The details of the production of the Coca alkaloids commercially are kept as a trade secret, but the broad methods of manufacture are all similar as several will illustrate.

Dr. Squibb has suggested the following process for the preparation of cocaine on a small scale:

One hundred grammes of finely ground leaves are moistened with 100 c.c. of 7 per cent solution of sodium carbonate, packed in a percolator, and sufficient kerosene added to make 700 c.c. of percolate. This is transferred to a separator, and 33 c.c. of 2 per cent solution of hydrochloric acid added and shaken. After separation the watery solution is drawn off from below into a smaller separator, and this process is repeated three times, the alkaloid being in the smaller separator as an acid hydrochlorate. This is precipitated in ether with sodium carbonate, and evaporated at low heat with constant stirring and the product weighed.

Another process is to digest Coca leaves in a closed vessel at 70° C. for two hours with a very weak solution of caustic soda, and petroleum boiling between 200° to 250°. The mass is filtered, pressed while tepid, and the filtrate allowed to stand until the petroleum separates from the aqueous liquid. The former is then drawn off and neutralized with weak hydrochloric acid. The bulky precipitate of cocaine hydrochloride being recovered from the aqueous liquid by evaporation.[196]

Gunn made a series of tests to determine what relation the methods of extraction had to the alkaloidal yield, and concluded that the modified method of Lyons obtained the most alkaloids.[197] This is substantially as follows:

Shake 10 grammes of finely powdered leaves with 95 c.c. of petroleum benzin and add 5 c.c. of the following mixture: Absolute alcohol,

196. Pfeiffer; XI.

197. Gunn; 1896.

19 volumes; concentrated solution ammonia, 1 volume. Again shake for a few minutes, and set aside for twenty-four hours with occasional shaking. Decant rapidly 50 c.c. of the clear fluid, or, if it is not clear, filter it, washing the filter with benzin. Transfer to a separator containing 5 c.c. of water, to which has been added 6 to 8 drops of dilute sulphuric acid (1 to 5 by weight). Shake vigorously; when the fluids have separated draw the aqueous portion into a one ounce vial. Wash the contents of the separator with 2½ c.c. of acidulated water (1 drop of the dilute acid). Shake, draw off into the vial, and continue this two or three times, until a drop tested on a mirror with Mayer's reagent shows only faint turbidity. Add to the aqueous fluid 15 c.c. of benzin, shake, and when separation is complete, pour off the benzin. Add to the vial 15 c.c. of stronger ether, U. S. P., with sufficient ammonia to render the mixture decidedly alkaline. Shake, and when separation is complete, decant the ether carefully into a tared capsule. Wash the residue in the vial with two or three successive portions of fresh ether until the aqueous fluid is free from alkaloid, as shown by the test. Evaporate the ether over a water bath. Dry the alkaloid to constant weight, weigh, multiply the result expressed in decigrammes by two, which will present the percentage of crude cocaine.[198]

Instead of extracting the alkaloid from the acid aqueous solution a simple method adapted to use in the field may be followed, in which the alkaloid is estimated by titration with Mayer's reagent. An acid solution representing 5 grammes of the leaves should be made up to a volume of 15 c.c., and the reagent added as long as it continues to precipitate in the clear filtrate. In this way, with half strength solution, 3.5 c.c. reagent represents 0.2 per cent of alkaloid.

Mayer's reagent, or the decinormal mercuric potassium iodide of the U. S. P., is prepared as follows: Mercuric chloride, 13.546 grammes, dissolved in 600 c.c. of water; potassium iodide, 49.8 grammes, dissolved in 190 c.c. of water; mix the two solutions and add sufficient water to make the whole measure, at 59° F., exactly 1000 c.c.

When Mayer's reagent is added drop by drop to an acid solution containing cocaine (1:200 to 1:600) there is at first produced a heavy white precipitate, which collects at once into curdy masses; a drop of solution should be examined on a mirror, and should not show more than slight turbidity when determining the final traces. Dr. Lyons suggests that after adding a certain quantity of the reagent it will be found that the filtered fluid which still gives a heavy precipitate with Mayer's reagent produces a precipitate also in a fresh solution of cocaine. It is thus evident that the precipitation is complete

198. Lyons; *Manual,* p. 74; 1886.

only when an excess of reagent is present in the fluid; and it is found advisable to correct the reading from the burette by subtracting for each c.c. of fluid present at the end of the titration 0.085 c.c. (if the half strength reagent is used); the remainder multiplied by ten will give the quantity of alkaloid indicated in milligrammes. The best method of following the process is to throw the fluid on a filter after each addition of reagent. Solutions of the alkaloid 1:400 appear to yield better results than solutions stronger or weaker than this.

One c.c. of Mayer's reagent will precipitate about 7.5 milligrammes of the mixed alkaloids from solutions in which alcohol is not present. As a rule the quantity of alkaloidal precipitate by this reagent is greater than the quantity of cocaine that can be extracted by washing out the alkaline solution with ether, so that in exact examinations a recourse to weighing is considered advisable. The dried precipitate weighed and multiplied by 0.406 will give about the amount of alkaloid present. With Mayer's reagent used in half strength the following values for the equivalent of the reagent are given:

Strength of cocaine solution	1 c.c. of Mayer's reagent (half strength) precipitates of cocaine
1:200	0.0062
1:300	0.0066
1:400	0.0070
1:500	0.0074
1:600	0.0078

The following table may also be of service:

Quantity of Mayer's Reagent (N_{20}^{1}) Necessary to Precipitate a Given Quantity of Cocaine

Quantity of Cocaine	Measure of Fluid Titrated			
	5 c.c.	10 c.c.	15 c.c.	20 c.c.
.010	1.6	...	...	...
.020	2.7	3.1	...	...
.030	...	4.2	4.6	...
.040	...	5.3	5.7	6.2
.050	...	6.4	6.8	7.3
.060	...	...	7.9	8.4
.070	...	...	9.0	9.5
.080	...	...	...	10.6
.090	...	...	...	11.7
.100	...	...	...	12.8

Results higher or lower than those indicated are beyond the limits of the experiment and would call for repetition.[199]

The principal tests employed to determine the purity of cocaine hydrochloride are the permanganate of potash and Maclagan's ammonia test. When one drop of a one per cent solution of permanganate of potash is added to 5 c.c. of a two per cent solution of hydrochloride of cocaine mixed with three drops of dilute sulphuric acid, it occasions a pink tint which should not entirely disappear within half an hour. When added to a stronger solution it occasions a precipitate of rhombic plates, which decompose on heating. If cinnamyl-cocaine be present the odor of bitter almonds is given off with the decomposition.

The Maclagan test is based upon the supposition that the amorphous alkaloids of Coca when set free by ammonia are separated as oily drops and so form a milky solution. It is employed by adding one or two drops of ammonia to a solution of cocaine, which is then vigorously stirred with a glass rod. If the salt is pure a formation of crystals will be deposited upon the rod and upon the side of the vessel within five minutes, while the solution will remain clear. If isatropyl-cocaine be present crystallization will not take place and the solution will become milky.

Considerable stress has been laid upon the value of this test for determining the purity of cocaine salts. Dr. Guenther [200] asserts that a perfectly pure cocaine will not show the Maclagan reaction, while if a small quantity of a new base which he described as *cocathylin,* with a melting point of 110° C., be present, the test will be pronounced. In endeavoring to show that this was an error, one of the largest manufacturers of cocaine in Germany worked up four thousand kilos of Coca leaves, and though they failed to find the new base which had been mentioned, they also proved that a pure cocaine will respond positively to the Maclagan test.[201] In support of this Paul and Cownley [202] have expressed the opinion that any cocaine which does not satisfy this test should not be regarded as sufficiently pure for pharmaceutical purposes, views which are also maintained by E. Merck.[203]

Of the various reagents that have been found delicate in testing for cocaine Mayer's reagent will detect one part in one hundred thousand,

199. Lyons; *Note;* 1886.

200. Guenther; Feb. 2, 1899.

201. Boehringer and Soehne; *person. com.:* Mannheim, Germany, 1899.

202. Paul and Cownley; p. 587; 1898.

203. *Person. com.;* Darmstadt; July, 1899.

while a solution of iodine in iodide of potash will determine one part in four hundred thousand, with a very faint yellow precipitate.

It has been shown by Gerrard that mydriatic alkaloids have a peculiar action with mercuric chloride, from the aqueous solution of which they precipitate mercuric oxide, the other natural alkaloids giving no precipitate at all, or at least not separating mercuric oxide. The late Professor Flückiger, verifying this action on cocaine, found the test recorded a very abundant purely white precipitate, which very speedily turned red, as in the case of the other mydriatic alkaloids.[204]

It has been found, on treating cocaine or one of its salts in the solid state with fuming nitric acid, sp. gr. 1.4, evaporating to dryness and treating with one or two drops of strong alcoholic solution of potash, there is given off on stirring this with a glass rod a distinct odor suggestive of peppermint.[205] This odor test has been pronounced very delicate and is distinctive for cocaine, no other alkaloid having been found to yield a similar reaction.

There are several cocaine manufacturers in Peru. A few years ago there were five in Huanuco, one in the District of Mozon, one in Pozuso, two at Lima, one at Callao, at least two of which are run on an extensive scale. In 1894 the amount of the crude product manufactured in Peru and sent abroad for purification was four thousand seven hundred and sixteen kilos. A personal communication from Peru, dated January 15, 1900, states that the local manufacturers of cocaine are increasing their facilities and claim that they work with a better method than is followed elsewhere.

In 1890 Dr. Squibb called attention to the fact that crude cocaine was made so efficiently in Peru that it seemed highly probable that the importation of Coca leaves to this market was nearly at an end. This crude cocaine has a characteristic nicotine odor; it comes in a granular powder or in fragments of press cake, generally of a dull creamy white color, but rarely quite uniform throughout, the color ranging from dirty brownish white to very nearly white. Some of the fragments are horny, compact and hard, while others are softer and more porous. The following process has been given for determining the amount of cocaine present in the crude product.[206]

A small quantity being taken from a large number of lumps in the parcels, selected on account of their difference in appearance, the determination of moisture in the samples so selected is found by fusion at 91° C. The solubility of the samples in ether at a specific gravity

204. Flückiger; 1886.

205. F. da Silva; 1890.

206. Squibb; XXXVIII.

.725 at 15.6° C., is then tested. The insoluble residue is thoroughly washed with ether, dried and weighed. The alkaloid dissolved by the ether is converted into oxalate, and the oxalate shaken out by water. The residue which is soluble in ether is then determined by evaporation of the ethereal solution. The aqueous solution of cocaine oxalate is rendered faintly alkaline by soda; the freed alkaloid shaken out with ether, and after spontaneous evaporation of the ether and complete drying of the crystals produced, the pure alkaloid is estimated. The usual yield of pure crystallizable alkaloid from this crude product varies from fifty to seventy-five per cent.

Crude cocaine when united with acids assumes an intense green color, due to the presence of benzoyl-ecgonine, while its characteristic chemical reaction is its property of splitting into benzoic acid and methyl alcohol.

Cocaine combines readily with acids to form salts, which are readily soluble in water and alcohol, though insoluble in ether. These salts, owing to their more ready solubility, have a more marked anaesthetic action on mucous surfaces than the pure alkaloid. There has been prepared benzoate, borate, citrate, hydrobromate, hydrochlorate, nitrate, oleate, oxalate, salicylate, sulphate, tartrate, etc.

According to the U.S. Pharmacopoeia the following are the characteristics of cocaine hydrochlorate, the salt commonly employed: "Colorless, transparent crystals, or a white crystalline powder, without odor, of a saline, slightly bitter taste, and producing upon the tongue a tingling sensation, followed by numbness of some minutes' duration. Permanent in the air. Soluble at 15° C. (59° F.) in 0.48 part of water and in 3.5 parts of alcohol; very soluble in boiling water and in boiling alcohol; also soluble in 2,800 parts of ether or in 17 parts of chloroform. On heating a small quantity of the powdered salt for twenty minutes at a temperature of 100° C. (212° F.), it should not suffer any material loss (absence of water of crystallization). The prolonged application of heat to the salt or to its solution induces decomposition. At 193° C. (379.4° F.) the salt melts with partial sublimation, forming a light brownish yellow liquid. When ignited it is consumed without leaving a residue. The salt is neutral to litmus paper."

In reviewing the research of many workers it may be seen how each has closely approached, often with a mere hint or suggestion, results which later have been verified and described more in detail. Through this repetition many new facts have been made positive to us. Assertions have been strengthened or have been cast aside, and while the result has been to render a cocaine of purer quality, it has at the same time emphasized the immensity of our ignorance concerning the subleties of alkaloidal formation.

More than all, these researches must impress the fact that similar changes to those which are possible in the laboratory of the chemist are also at work in Nature's laboratory, and that the therapeutic influence and efficiency of Coca, as of any remedy taken into the body, must be markedly affected by the transmutations of the organism.

It is not so many years ago that it was taught there was an abrupt difference between the chemistry of the inert and the living, while the several compounds that were described as cast out by living cells were supposed only capable of production by organized structures, but when Woehler manufactured urea synthetically, it was seen that this sharp distinction could no longer be true. Among organized bodies the association, and even interdependence, between the higher order of plants and animals is of course even far more striking. Long before the Christian Era Aristotle attempted to trace an absolute connection between all living things, and though it would seem that one might immediately pronounce to which class an organism belongs, it is really not so simple. The lower forms of one so nearly approach the lower forms of the other order that biologists have often found extreme difficulty in determining a classification that shall be generally accepted by naturalists.

The old illustration as showing the distinction between plants and animals, that the former absorb carbonic acid and give off oxygen, while animals do just the reverse, is only partially true, for while it is a fact that animals give off carbonic acid, plants cannot live in the absence of oxygen, which is essential to furthering the processes of their metabolism. As another illustration, it was shown that plants have not the power of voluntary motion possessed by animals, but this assertion was shown to be wrong by numerous examples among the lower forms which are precisely the reverse. All individual cells must possess the power of motion, and some of the lower plant organisms actually move from place to place—indeed, locomotion is absolutely necessary to their existence.[207] On the other hand, some lower animal structures are permanently fixed, so that the older comparisons are not definite. Similar chemical changes take place in the cell structure of plants and animals. All must have motion incidental to growth, together with the functions of sleep, nutrition and irritability, which latter property is manifest by certain plants to a remarkable degree under the influence of such nitrogenous foods as raw meat, milk or albumen.[208]

207. Darwin; 1880.

208. *Idem;* 1875.

As vegetable alkaloids are considered to be the excreta of plants, we cannot properly draw any conclusion concerning their probable formation without regarding the changes which are brought about in the life of the organism producing them. As these processes are intimately allied to changes which are undergone under similar conditions in the animal being, a review of the subject may not be wholly uninteresting, while it will enable us to more fully appreciate the possible action of the products of the Coca leaf when we come to consider the application of that interesting plant more directly in the human economy.

All organic structure is built up through a constant breaking down and rearrangement of simple chemical elements. In the case of plants, the compounds of the elements which have been admixed with the soil are carried in solution through the root to the most remote cells of the leaf. There these chemical bodies are converted into complex substances, which under suitable stimuli are built to form the tissues of the organism. These subtle changes take place only under the influence of that mighty alchemist, the sun.

It would seem that the Incas were not far wrong in regarding this great source of light and activity as at least the physical source of all power, for not only is plant life dependent upon the action of the sun, but the animal being is in turn dependent upon plant structure. Those compounds which have been so mysteriously molded into vegetable organisms must be torn apart and dissolved in order to set free the elements of which animal structure is composed. Here these elements are rearranged to the necessities of a higher organization, where they may continue a still more complex existence. This constant interchange is carried on through plants and animals—through animals and plants—each organism converting and reconverting, from age to age, the various elements appropriate to its own requirements. In the performance of these functional processes, each cell of the tissues creates for itself, as well as for surrounding bodies, that combination of energy which we call life. These changes are carried on without intermediary loss of matter—which we know is indestructible—regardless of the extent or method of the many conversions it may have undergone since creation, and shall continue to undergo until the end of time. So that it is theoretically, if not literally, possible that:—

"Imperious Caesar, dead and turn'd to clay,
Might stop a hole to keep the wind away."

There are four principal elements of the sixty-seven or more known ones which may be regarded as the very basis of life. These are carbon, hydrogen, oxygen and nitrogen, and all organic changes take place in

accordance with the varying proportions that these elements unite with each other. Carbon we are apt to carelessly regard as that coke-like substance made familiar to us through its employment in electricity, without stopping to recall its important relation to all organic tissue. It enters into the building of other cells than electric, for it is found, without exception, in every tissue of organic life. It seems difficult to understand how so apparently inert a substance can become intimately incorporated with living structures. Carbon, which as a product of combustion is everywhere diffused as carbonic acid, is carried as a gas and in solution to the plant and is absorbed by the roots and stomata of the leaves. Here under sunshine it is deposited for immediate use or to form emergency food for the tissues, while the oxygen is set free to again enter into the performance of those multiple chemical processes included in growth and decay. So important is the influence of carbon in all organic structures that Pflüger has advanced the theory that carbon united with nitrogen as cyanogen constituted the radical which formed the very nucleus of creation—of that molten chaos from which all existence sprung.

Nitrogen may be regarded, if not as the source of all energy, certainly as the chemical creator of force, for it is absolutely necessary in all compounds from which power is to be derived. The changes due to oxygen are so much more spoken of that it would seem the importance of nitrogen is often disregarded. Though everywhere about us this element cannot, like oxygen, be readily forced into union, and plants cannot take in free nitrogen. But so essential is this subtle element to all organic energies through its formation of proteids and their decomposition, that it must be coaxed into suitable combinations by similar transmutations as those for the deposit of carbon—the activity of vegetable life under the stimulus of sunshine. Its combinations, however, are loose and maintained with difficulty, yet this very effort for constant freedom causes this to be the most important element of all chemical compounds in which it is associated. The property of nitrogen of escaping from union and liberating energy is made use of in the high explosives, and is also exhibited in the more subtle decompositions of decay, which owe their potency to the nitrogen contained in their ammonia.

Similar changes due to the influence of nitrogen are constantly going on in the processes of metabolism in all organic tissue. We have an instance of this when the carbohydrates of plants are converted into proteid structures, which, decomposing, again set free their nitrogen as excreta in the form of alkaloids. Again this property is shown in the human laboratory when the pent-up nitrogen in the Coca leaf is brought to bear upon the customary maize dietary of the Andean,

and as a result the starchy elements are converted into the more complex molecule of the flesh-forming proteid.

With these four primary elements are mingled others, including sulphur, phosphorus, potassium, calcium, magnesium, iron, and the gaseous element chlorine, all of which may serve to nourish certain tissues of the organism to which they are carried in solution of various compounds. So while the several primary elements are essential to the structure of every organism, it is impossible for them to be utilized in the upbuilding of tissue until carried to the cell in fluid form. In the case of plant life, the elements are conveyed in such dilution of their salts that their presence is seemingly physically absent, while the fluids are apparently but simple water. This solution is taken up from the soil through the roots, yet the selection may not be only of such substances as are of positive nutritive value, but of other substances in solution, which may even be injurious.

Just as in the human organism, assimilation in plant tissue cannot take place except through solution, so the stored up starch is of no immediate service until it is rendered soluble. In other words, it must be prepared in a way analogous to the digestion of food in animal tissues. This is done by the action of certain ferments manufactured by the protoplasm. These do not directly enter into the upbuilding of tissue themselves, but induce the change in the substance upon which they act. Chiefly by a process of hydration, in which several molecules of water are added, the insoluble bodies are rendered soluble, and are so carried in solution to various portions of the plant. Here they are rearranged as insoluble starch, to serve as the common storage tissue for sustenance. Thus it will be seen how very similar are the processes of assimilation in plants and animals, a marked characteristic between both being that the same elementary chemical substances are necessary in the upbuilding of their tissues, and particularly that activity is absent where assimilable nitrogen is not present. Although urea and uric acid are not formed in plants, the final products of both animals and plants are closely allied. We see this especially in the alkaloids caffeine and theobromine, which are almost identical with uric acid, so much so that Haig considers that a dose of caffeine is equivalent to introducing into the system an equal amount of uric acid.

There are numerous examples, not only in medicinal substances, but in the more familiar vegetables and fruits, which illustrate the possibilities of change due to cultivation. The Siberian rhododendron varies its properties from stimulant to a narcotic or cathartic, in accordance with its location of growth. Aconite, assafoetida, cinchona, digitalis, opium and rhubarb are all examples which show the influ-

ence of soil and cultivation.[209] Indeed similar effects are to be seen everywhere about us, certain characteristics being prominently brought forth by stimulating different parts of the organism, so that ultimately distinct varieties are constituted. The poisonous Persian almond has thus become the luscious peach. The starchy qualities of the potato are concentrated in its increased tuber, and certain poisonous mushrooms have become edible. The quality of the flour from wheat is influenced by locality and cultivation. The tomato, cabbage, celery, asparagus, are all familiar examples which emphasize the possibility of shaping nature's wild luxuriance to man's cultured necessity.

The chemical elements which are taken up by a plant vary considerably with the conditions of environment, and the influence of light in freeing acid in the leaf has been indicated. These conditions necessarily modify the constituents of the plant. When metabolism is effected certain changes take place in the tissues, with the formation of substances which may be undesirable to the plant, yet may be medicinally serviceable. Such a change occurs in the sprouts of potatoes stored in the dark, when the poisonous base *solania* is formed, which under normal conditions of growth is not present in the plant. A familiar example of change due to environment is exhibited in the grape, which may contain a varying proportion of acid, sugar and salts in accordance with the soil, climate and conditions of its cultivation, nor are these variations merely slight, for they are sufficient to generate in the wine made from the fruit entirely different tastes and properties.

In view of these facts, it seems creditable to suppose that by suitable processes of cultivation the output of alkaloids may be influenced in plants, and such experiments have already been extensively carried out in connection with the production of quinine. When attention was directed to the scientific cultivation of cinchona in the East, it was remarked that when manured with highly nitrogenous compounds the yield of alkaloid was greatly increased. This is paralleled by the fact that when an animal consumes a large quantity of nitrogenous food the output of urea and uric acid is greater.

Alkaloids are regarded as waste products because they cannot enter into the constructive metabolism of the plant, though they are not directly excreted, but are stored away where they will not enter the circulation, and may be soon shed, as in the leaf or bark. Though, as indicating their possible utility, it has been shown experimentally that plants are capable of taking up nitrogenous compounds, such as urea, uric acid, leucin, tyrosin, or glycocol, when supplied to their

209. Paris; p. 72, *et seq.;* 1846.

roots. In some recent experiments carried out at the botanical laboratory of Columbia University, I found that plant metabolism was materially hastened under the stimulus of cocaine.

The influence of light in the formation of alkaloids has already been shown. Tropical plants which produce these substances in abundance in their native state often yield but small quantities when grown in hot houses, indicating that a too intense light is unfavorable, probably in stimulating a too rapid action of the chlorophyl, together with a decomposition of the organic acid. Some years ago the botanist, Dr. Louis Errera, of Brussels, found that the young leaves of certain plants yielded more abundant alkaloid than those that were mature. Following this suggestion, Dr. Greshoff is said to have found that young Coca leaves yield nearly double the amount of alkaloid over that contained in old leaves gathered at the same time. In tea plantations the youngest leaves are gathered, but it has always been customary to collect the mature leaves of the Coca plant, and these have usually been found to yield the greatest amount of alkaloid. The probability is that the amount of alkaloid present in the Coca leaf is not so much influenced by maturity as it is by the period of its gathering.

As regards the temperature at which growth progresses most favorably, Martins [210] has compared each plant to a thermometer, the zero point of which is the minimum temperature at which its life is possible. Thus, the Coca shrub in its native state will support a range from 18° C. (64.4° F.) to 30° C. (86° F.), an influence of temperature which is governed by the proportion of water contained in the plant. It has been found, from experiments of cultivation, that Coca will flourish in a temperature considerably higher than that which was originally supposed bearable, though the alkaloidal yield is less than that grown more temperately. The life process of any plant, however, may be exalted as the temperature rises above its zero point, though only continuing to rise until a certain height is reached, at which it ceases entirely. In the cold, plants may undergo a similar hibernation as do certain animals when metabolism is lessened, though long-continued cold is fatal, and frost is always so absolutely to Coca. The influence of temperature on metabolism tends to alter the relations between the volume of carbonic acid given off and the amount of oxygen absorbed. Under a mean temperature these relations are equal, while in the lower temperature more oxygen is absorbed in proportion to the carbonic acid given off, and oxygen exhalation ceases entirely below a certain degree.

210. Martins; 1846.

A relatively large proportion of water in a plant determines its susceptibility to climatic conditions. Thus freezing not only breaks the delicate parenchymatous tissues, but alters the chemical constitution of the cells, while too high a temperature may prove destructive through a coagulation of the albumen, the appearance of plants killed by high or low temperature being similar. Roots are stimulated to curve to their source of moisture, and their power for absorption is more active in a high than in a low temperature, but as absorption is influenced by the transpiration of the plant, it is less active in a moist atmosphere, unless the metabolic processes of the plant occasions a higher temperature than the surrounding air. Such activity would be increased by the heat of the soil about the roots, and is probably manifest in the Coca plant through the peculiar soil of the montaña.

The elevation at which a plant grows has an influence upon the absorption by the leaf. Thus it has been observed that while a slight increase in the carbonic acid gas contained in the air is favorable to growth, a considerable increase is prejudicial, while an increase or diminution of atmospheric pressure materially influences plant life. In some tropical countries Coca will grow at the level of the sea, provided there is an equable temperature and requisite humidity. Although in Peru Coca flourishes side by side with the best coffee, it will not thrive at the elevations where the coffee plant is commonly grown in either the East or West Indies. In Java, where experiments have been made in cultivating Coca, it has been stated that there is no perceptible difference in the alkaloidal yield due to the influence of elevation, while in the best cocals of Peru it is considered that the higher the altitude at which Coca can be grown the greater will be the alkaloidal yield. This is possibly effected by similar influences to that governing the aromatic properties developed in the coffee bean, which have been found more abundant when coffee is grown at an elevation, yet without danger of frost. This may be attributed to slower growth and a consequent deposit of nitrogenous principles instead of their being all consumed through a rapid metabolism.

It is therefore evident that as these several physical conditions have a marked bearing upon the life history of all plants, the more limited the range for any of these processes in any particular plant, the more it will be influenced. Thus in an altitude too high, the leaf of the Coca plant is smaller and only one harvest is possible within the year, while in the lower regions where the temperature exceeds 20° C. (68° F.) vegetation may be exuberant, but the quality of leaf is impaired. The electrical conditions of the atmosphere, it has been shown, have an important bearing upon the development of Coca, through

the influence of the gases set free in the atmosphere and the possible slight increase of nitric acid carried to the soil.

It was thought by Martius that the mosses and lichens which are found upon the Coca shrubs were detrimental to the plant through favoring too great humidity. In the light of our knowledge on the development of alkaloids, however, it has seemed to me that here is an opportunity for very extended experimentation, as may be inferred from a reference to the alkaloidal production of cinchona. At first efforts were made to free the cinchona trees from the lichens and mosses which naturally formed upon them; but it was discovered accidentally that those portions of the trees which Nature had covered in this manner yielded an increased amount of alkaloid. When cinchona plantations were started in Java, experiments made upon the result of this discovery prompted a systematic covering of the trunks of the trees artificially with moss, which was bound about them to the height from which the bark would be stripped. At first very great pains were taken to collect just an appropriate kind of moss, which it was supposed from its association with the tree in its native home would be essential, but later experiments proved that any form of covering which protected the bark from light increased this alkaloidal yield. So that to-day this process, which is known as "mossing," is one of the most important in the cultivation and development of cinchona.

The chief interest of Coca to the commercial world has centered upon its possibilities in the production of the one alkaloid, cocaine, instead of a more general economic use of the leaf. Because of this, much confusion of terms has resulted, for chemists have designated the amount of alkaloids obtained from the leaf as cocaine, although they have qualified their statement by saying that a portion of this is uncrystallizable. Numerous experiments have been conducted to determine the relative yield of cocaine from the different varieties of Coca, and when uncrystallizable alkaloids have been found the leaf has been condemned for chemical uses. It will thus be appreciated how a great amount of error has been generated and continued. The Bolivian or Huanuco variety has been found to yield the largest percentage of crystallizable alkaloid, while the Peruvian or Truxillo variety, though yielding nearly as much total alkaloid, affords a less percentage that is crystallizable, the Bolivian Coca being set apart for the use of the chemists to the exclusion of the Peruvian variety, which is richest in aromatic principles and best suited for medicinal purposes. As a matter of fact, the Peruvian Coca is the plant sought for by the native users.

There is not only a difference in the yield of alkaloid from different varieties of Coca, but also a difference in the yield from plants of one

variety from the same cocal, and it would seem possible by selection and propagation of the better plants to obtain a high percentage of alkaloid. At present there is no effort in the native home of Coca toward the production of alkaloid in the leaf through any artificial means. Regarding the quality of alkaloid that has been found in the different plants, the Peruvian variety has been found to contain equal proportions of crystallizable and uncrystallizable alkaloid, while the Bolivian variety contains alkaloids the greater amount of which are crystallizable cocaine. Plants which are grown in conservatory, even with the greatest care, yield but a small percentage of alkaloid, of which, however, the uncrystallizable alkaloid seems more constant while the relative amount of cocaine is diminished. In leaves grown at Kew .44 per cent of alkaloid was obtained, of which .1 per cent was crystallizable. From experiments of Mr. G. Peppe, of Renchi, Bengal, upon leaves obtained from plants imported from Paris, it was found that leaves dried in the sun yielded .53 per cent of alkaloid, of which .23 per cent was uncrystallizable. The same leaves dried in the shade on cloth for twenty hours, then rolled by hand, after the manner in which Chinese tea is treated, then cured for two and a half hours and dried over a charcoal fire and packed in close tins, yielded .58 per cent of alkaloid, of which .17 per cent was uncrystallizable.

It is probable that each variety of Coca has a particular range of altitude at which it may be best cultivated. The Bolivian variety is grown at a higher altitude than Peruvian Coca, while the Novo Granatense variety has even been found to thrive at the level of the sea. Among Coca, as among the *cinchona,* certain varieties yield a large proportion of total alkaloids, of which only a small amount is crystallizable. The *Cinchona succirubra* yields a large amount of mixed alkaloids, but a small amount of quinine, while *Cinchona Calisaya* yields a smaller amount of mixed alkaloids and a large amount of crystallizable quinine. A few authors who have referred to the alkaloidal yield of Coca leaves have casually remarked that the plants grown in the shade produce an increased amount above those grown in the sun, which would appear to be paralleled by the formation of chlorophyl and the production of proteids, both of which have so important a bearing upon the metabolism of the plant and the final nitrogenous excretion.

This subject is one full of interest, yet so intricate that it has not been possible for me to elaborate the suggestions here set forth in time to embody my investigation in the present writing, though I hope to present the result of my research at a not very distant date. It would seem that sufficient has been shown, however, to indicate the pos-

sibility of modifying plant metabolism under appropriate conditions of culture so as to influence the development of the alkaloidal excreta. The comparisons between plant and animal life may have proved of sufficient interest to enlist attention to the higher physiology in which will be traced the action of Coca.

A lady suffering from a severe influenza accompanied with rheumatism, was induced to try a grog of Vin Mariani—as advocated by Dr. Cyrus Edson in the treatment of La Grippe,[211] and much to her surprise found that she was not only cured of her cold, but entirely relieved from the symptoms of her rheumatism as well, despite a preformed prejudice against Coca in any form. Acting upon this suggestive hint, I have found that alternate doses of Coca and the salicylates constitute an admirable treatment for rheumatism.

The influence of Coca in banishing the effects of extreme fatigue is well illustrated in an account of its use communicated to me by Dr. Frank L. James, Editor of the *National Druggist,* St. Louis. While a student at Munich he experimented with the use of Coca upon himself at the request of Professor Liebig, whose pupil he was. On one occasion, when exceedingly tired both physically and mentally, he was induced to try chewing Coca after the proper Peruvian fashion with a little *llipta.* Before commencing this experiment he was hungry, but too tired to eat and too hungry to sleep. In a few moments after beginning to chew hunger gave place to a sense of warmth in the stomach, while all physical weariness disappeared, though mentally he was still somewhat tired and disinclined to read or study. This condition soon passed away, giving rise to an absolute eagerness to be at some sort of exercise. These sensations lasted altogether for probably three hours, gradually passing off after the first hour, leaving the subject none the worse for his experience and able to eat a hearty dinner the same evening.

Some years afterward, while practicing in the South, this gentleman returned from a thirty-six hours' ride so tired as to necessitate being helped off the horse and up-stairs to his room. While preparing for bed his eyes fell upon a package of Coca leaves which he had recently received by way of San Francisco, and the idea immediately occurred to him to repeat the experiment of his student days. In the course of a quarter of an hour—following the chewing of probably a drachm of Coca leaves—he felt so refreshed and recuperated that he was able to go out and visit patients about the town to whom he had previously sent word that he was too tired to call on them that night. In describ-

211. Edson; p. 39; 1891.

ing the result, Dr. James said: "I was not very hungry at the time before taking the Coca, but all sense of the necessity or of a desire for food vanished with the weariness." [212]

Professor Novy, of the University of Michigan, is referred to by one of his former classmates as having formed one of a group of experimenters upon the use of Coca leaves. The influence being tested during a walk of twenty-four miles, taken one afternoon without any other nourishment but water and Coca. Over four miles an hour was averaged, and although unaccustomed to such long walks or vigorous exercise, no special muscular fatigue was experienced by four of the party who chewed the leaves almost constantly during the journey. No change was noted in the urine and no depression was experienced the next day. One who did not chew Coca, but was addicted to alcohol and chewed tobacco constantly, was somewhat more fatigued than the others, and suffered considerably from soreness of the muscles on the following day.[213]

The experience of Sir Robert Christison, of Edinburgh, with the use of Coca upon himself and several of his students, is full of interest because of his extended experiments and the high rank of the investigator. Two of his students, unaccustomed to exercise during five months, walked some sixteen miles without having eaten any food since breakfast. On their return they each took two drachms of Coca made into an infusion, to which was added five grains of carbonate of soda, in imitation of the Peruvian method of adding an alkali. All sense of hunger and fatigue soon left, and after an hour's walk they returned to enjoy an excellent dinner, after which they felt alert during the evening, and their night's sleep was sound and refreshing. One of these students felt a slight sensation of giddiness after drinking the infusion, but the other experienced no unpleasant symptoms. Ten students, under similar conditions, walked varying distances, from twenty to thirty miles, over a hilly road. Two of these were unable to remark any effects from the use of Coca, several felt decided relief from fatigue, while four experienced complete relief, and one of these had walked thirty miles without any food. Professor Christison, though seventy-eight years of age and unaccustomed to vigorous exercise, subsequently experimented on himself by chewing Coca leaves with and without *llipta*, some of which had been forwarded to him from Peru. He first determined the effect of profound fatigue by walking fifteen miles on two occasions without taking food or drink. On his return his pulse, which was normally sixty-two at rest, was one hundred and

212. *Collective Investigation;* (924); 1898.

213. *Idem;* (586); 1898.

ten on his arrival home, and two hours later was ninety. He was unfit for mental work in the evening, though he slept soundly all night, but the next morning was not inclined for active exercise. Then, under similar conditions, he walked sixteen miles, in three stages of four, six, and six miles, with one interval of half an hour, and two intervals of an hour and a half. During the last forty-five minutes of his second rest he chewed eighty grains of Coca, reserving forty grains for use during the last stage, even swallowing some of the fibre. He felt sufficiently tired to look forward to the end of his journey with reluctance, and did not observe any particular effect from the Coca until he got out of doors and put on his usual pace, of which he said: "At once I was surprised to find that all sense of weariness had entirely fled and that I could proceed not only with ease, but even with elasticity. I got over the six miles in an hour and a half without difficulty, and found it easy when done to get up a four and a half mile pace and to ascend quickly two steps at a time to my dressing room, two floors up-stairs; in short, I had no sense of fatigue or any other uneasiness whatsoever."

During this walk he perspired profusely. On reaching home his pulse was ninety, and in two hours it had fallen to seventy-two, showing that the heart and circulation had been strengthened under the influence of Coca. The urine solids were the same as during the walk without Coca. In describing this walk, he said: "On arrival home before dinner, I felt neither hunger nor thirst, after complete abstinence from food and drink of every kind for nine hours, but upon dinner appearing in half an hour, ample justice was done to it." After a sound sleep through the night he woke refreshed and free from all sense of fatigue. An influence of Coca not anticipated was the relief of a tenderness of his eyes, which during some years had rendered continuous reading a painful effort. In another trial at mountain climbing, he ascended Ben Vorlich, on Loch Earn, 3,224 feet above the sea. The climb was along a rugged foot path, then through a short heather and deep grass, and the final dome of seven hundred feet rise was among blocks and slabs of mica-slate. The ascent was made in two and a half hours, the last three hundred feet requiring considerable determination.

His companions enjoyed a luncheon, but Sir Robert contented himself chewing two-thirds of a drachm of Coca, and after a rest of three-quarters of an hour was ready for the descent. Although this was looked forward to with no little distrust, he found upon rising that all fatigue was gone, and he journeyed with the same ease with which he had enjoyed mountain rambles in his youth. The experimenter was neither weary, hungry nor thirsty, and felt as though he could easily

have walked four miles to his home. After a hearty dinner, followed by a busy evening, he slept soundly during the night and woke refreshed in the morning, ready for another day's exercise. During the trip he took neither food nor drink of any kind except chewing sixty grains of Coca leaves. Eight days after this experiment was repeated, using ninety grains of Coca. The weather had changed and the temperature was forty-four degrees at the top of the mountain and a chilly breeze provoked the desire to descend. While resting sixty grains of Coca was chewed. The descent was made without halt in an hour and a quarter, and followed by a walk of two miles over a level road to meet his carriage. He then felt slightly tired, because three hours had elapsed since he had chewed Coca.

In summing up his experience Professor Christison says: "I feel that without details the general results which may now be summarized would scarcely carry conviction with them. They are the following: The chewing of Coca not only removes extreme fatigue, but prevents it. Hunger and thirst are suspended, but eventually appetite and digestion are unaffected. No injury whatever is sustained at the time or subsequently in occasional trials." From sixty to ninety grains are sufficient for one trial, but some persons either require more or are constitutionally proof against the restorative action of Coca. From his observations there was no effect on the mental faculties except to prevent the dullness and drowsiness which follow great bodily fatigue.[214]

The Indian sustained by Coca remains fit and active, and is apparently fresh and ready after a hard day's jaunt. It seems probable that this condition is occasioned through the converting influence of the nitrogenous Coca acting upon the stored-up carbohydrates of the Andean's accustomed dietary. Thus while promoting metabolism and increasing energy the blood current is at the same time kept free.

A preparation of Coca made in Paris known as "Velo-Coca," is purposely intended for the use of bicyclists, a given dose of which is calculated to sustain the rider through forty kilometres—twenty-five miles. The advantage of Coca in long distance contests has long been known to certain professionals, who have endeavored to keep their use of this force sustainer a secret.[215]

Some years ago the members of the Toronto La Crosse Club experimented with Coca, and during the season when that club held the championship of the world Coca was used in all its important matches. The Toronto Club was composed of men accustomed to sedentary

214. Christison; April 13, 1876; also *Pharmaceutical Journal and Transactions* (3); Vol. VI, p. 884.

215. McLaumaille; 1875.

work, while some of the opposing players were sturdy men accustomed to out of door exercise. The games were all very severely contested, and some were played in the hottest weather of one summer; on one occasion the thermometer registered 110° F. in the sun. The more stalwart appearing men, however, were so far used up before the match was completed that they could hardly be encouraged to finish the concluding game, "while the Coca chewers were as elastic and apparently as free from fatigue as at the commencement of the play." At the beginning of the game each player was given from one drachm to a drachm and a half of leaves, and this amount, without lime or any other addition, was chewed in small portions during the game. The first influence experienced was a dryness of the throat, which, when relieved by gargling with water, was not again noticed, while a sense of invigoration and an increase of muscular force was soon experienced, and this continued through the game, so that fatigue was resisted. The pulse was increased in frequency and perspiration was excited, but no mental symptoms were induced excepting an exhilaration of spirits, which was not followed by any after effects.[216]

As has been shown, fatigue and its ills is occasioned by a diminution of the elements necessary to activity as well as to an excess of waste materials in the blood. This latter cause alone explains many problems dependent upon this condition which are commonly assigned to other causes. Under this hypothesis it is easy to appreciate not only the cause of muscle fatigue, but the irritability from nerve tire as well as the restlessness in wasting disease. When the tissues are not supplied with a blood stream that is pure and uncontaminated they cannot respond healthfully. A blood current already overburdened with waste can neither stimulate to activity nor carry off the burden of excreta.

The power of Coca to relieve the circulation, and so bring about a condition indicating a free blood stream, has been emphasized by a host of observers. Speaking of the action of but one of its alkaloids, Dr. Haig says: "Some have asserted that it is oblivion men seek for when they take opium, cocaine, etc., I believe this to be a great error. Give me an eternity of oblivion and I would exchange it for one hour with my cerebral circulation quite free from uric acid, and opium or cocaine will free it for me. When the blood stream is free the pulse tension is reduced, the rate is quickened, and the increased flow alters the mental condition as if by magic; ideas flash through the brain; everything is remembered." [217]

216. Shuttleworth; 1877.

217. Haig; p. 247, *et seq.;* 1897.

Hitherto the usual explanation that has been advanced as to the influence of Coca—when any influence has been accorded—has been its stimulant action upon the nerves. In view of the facts set forth in this research such a theory seems inadequate. I have endeavored to show by a succession of facts and many examples, that the sustaining influence of Coca in fatigue, as well as its curative power in so many diseased conditions, as to render it a seeming panacea, is largely due to a direct action upon the cells of the tissues, as well as through the property which Coca has of freeing the blood from waste. This influence may chiefly be upon the brain or upon the muscular structure, in accordance with the relative proportion of the associate principles present in the Coca leaf employed. Under this hypothesis, based upon physiological research as well as upon the theory of the formation of proteid in plants and in animals, Coca not only stimulates the cells to activity and so sets free energy, but may build up new tissue through exciting the protoplasm to appropriate conversion. Such an hypothesis is certainly plausible when we consider the action of amides and other nitrogenous elements in plant structure. This is again emphasized by its harmony with recent theories of Pflüger regarding the building up of proteid tissue in the animal organism. So much testimony points to this conclusion that in the entire absence of other scientific explanation this is certainly worthy of serious consideration.

The functions of the body are governed through the action of the nervous system involuntarily, whether the subject be asleep or awake, in sickness or in health. This action, however, may be influenced by the will either to depress or excite individual functions, so that their action may be modified or even perverted to a condition of disease. Dr. John Hunter, who was a victim to his own emotions, emphasized this when he wrote: "Every part of the body sympathizes with the mind, for whatever affects the mind, the body is affected in proportion." [218]

Among the annoyances incidental to a modern civilization are those troubles produced from a possible nervous perversion, engendered through overtaxing the powers mentally or physically in the modern whirl and bustle of a busy life. We all realize the effects of muscular fatigue, but few seem to appreciate the extreme tire which is possible to the nervous system of the purely sedentary worker. This may manifest itself in the mildest form as a mere irritability or restlessness, or more profoundly as peevishness and even despondency.

It is not as easy to demonstrate nerve tire in the laboratory as it is to show the fatigue of muscle, yet there can be no doubt that similar

218. Hunter; Vol. IV, p. 167; 1839.

factors are at work to induce either. It is known that all the activity of the tissues, of whatever kind, is due to a chemical conversion of the substance contained in the minute cells which go to complete the organism. Fatigue results from the retention of products of waste in the blood which normally should be excreted. As a result the tissues are not properly nourished by a purified circulation for their work, and exhaustion is a consequence, whether the structure under this influence be muscle or nerve.

When we learn that Coca relieves muscular tire, mental depression or nervous fatigue, that it calms to refreshing sleep or stimulates to wakefulness and activity, that it allays hunger or induces appetite as the case may be, we can only harmonize such seemingly opposite applications through appreciating that this influence is extended to the tissues through the fluid which supplies them with nourishment. We have already seen that the blood is so speedily purified under the action of Coca that the circulation may at once return an appropriate pabulum to all the cells of the body and so may promote in them a normally healthful action.

The brain may be broadly considered as made up of cells and nerve fibres. The outer portion, which is termed the cortex, consists of many convolutions which through this arrangement affords a greater superficial area for the brain cells. These cells are located in layers over the surface, as well as arranged in groups at the base of the brain and in the medulla and spinal cord. The convolutions are merely rudimentary in animals and are poorly developed in the lower orders of the human race and in the uneducated. By intellectual development these are increased in a manner quite analogous to that in which muscle is increased by exercise. Gross bulk of brain substance does not necessarily indicate giant intellect, but merely the structure for such possible development.

The brain practically attains its greatest size in early childhood, at least this is the period of its most active increase, and remembering the law that the part of the body which is subject to the greatest physiological growth is most liable to disease, it will keep before us the fact that children are particularly susceptible to disorders of the brain and nervous system. In childhood the tendency should be to restrain these organs, which are already too alert, from an undue excitement.

From birth an education of the individual cells of this intellectual centre should be carefully conducted. A refinement of nerve tissue progressing by easy gradations until strength and power shall be secured. It is through this alone that man may be raised superior to the beast or savage. Not only present enjoyments but future comforts and

realizations are so absolutely dependent upon this that even "Spiritual life can only reach the human form by and through the brain cell." [219]

Whether the title neurasthenia be scientifically correct for the peculiar train of symptoms which go to make up the complainings of the victims of over-nervous irritability, it has served since the classification of some thirty years ago to enable the acute medical examiner to group the particular sufferers from this morbid condition. As defined by Dr. Beard, neurasthenia is: "A chronic functional disease of the nervous system, the basis of which is the impoverishment of nervous force; deficiency of reserve, with liability to quick exhaustion, and the necessity for frequent supplies of force. Hence the lack of inhibitory or controlling powers, both physical and mental, the feebleness and instability of nerve action, and the excessive sensitiveness and irritability, local and general, and the vast variety of symptoms, direct and reflex." [220]

The condition may be summed up as one of nervelessness, or a weakness of irritability akin to the symptoms which indicate profound tire. A host of modern physiologists regard fatigue as due to some poison in the blood.[221] If we accept this theory founded upon chemical facts which may be clearly demonstrated by experiment, there is ample means for explaining the multiplicity of nervous symptoms as resulting from this cause alone. Waste matters in the circulation by clogging the capillaries prevent the venous blood from being appropriately purified. The nerve centers do not receive suitable stimulus for repair, and the increased irritability occasions an excessive waste which still further impedes the circulation. Functional changes must necessarily result in the heart, kidneys, liver and the brain from this continued irritation.

The subjective symptoms of neurasthenia are not so much engendered by a weakness of the nervous system, nor any lack of susceptibility of the nervous protoplasm to respond to irritation, as through excessive irritability, which renders the organism over sensitive to normal and healthful stimulus. It is a condition which may be allied to the harp, so strung up as to permit the slightest breath to set its strings in a discordant hum. Often the subjects of this form of trouble are found among those who are in the prime of activity, in early adult life, when the various forces for the production of energy are being vigorously employed.

As it is that part of the body which is most active at any one period

219. Wilson; 1899.

220. Beard; p. 36; 1886.

221. Foster; *Lancet*, Vol. I, p. 1457; 1893.

of life—particularly of growth—that is most liable to disease, so during the different epochs of pubescence, adolescence, and the early marital life in either sex, the symptoms of neurasthenia may be exhibited. These symptoms are particularly manifest when there has been at these periods a condition of overstrain, associated with mal-nutrition. Among all possible causes my experience has been that the genetic factor, through repeated explosive shocks upon the nervous system, is pre-eminent in the production of neurasthenic symptoms in those already overworked or suffering from imperfect nutrition.

Neurotics are prone to excesses as well as to extremes in any particular line. They are the class to which "habits" cling and "habit drugs" belong, and the apparent candor of their sufferings might often lead the sympathetic, unwary listener astray. In such subjects these habits and excesses should be regarded rather as symptoms than the underlying cause of the condition.

The numerous symptoms which go to make up the condition of nervous prostration have only been made prominent through the push for supremacy, and even for maintenance, in the various specialisms of life. While the causes always have existed, modern civilization has greatly exaggerated them, and the present dwellers in cities are consequently eminently of the nervous type. The sufferers are not all from one class, but are numbered among the high, the low, the rich and the poor, though the symptoms may be varied in accordance with the cultivation and environment of the patient. What the poor Andean Indian, working laboriously for days on scanty food, might regard as the ban of some "spirit of the mountain" cast upon him for presuming to invade some hallowed precinct and as a charm against which he chews the sacred Coca, the used up subject of protracted social functions considers in a different light. But the symptoms and conditions are similar, whether occasioned from over-indulgence or overwork, because of exalted ambition, or from enforced labor associated with hygienic errors.

We are apt to approach matters wrongly; as a result benefits are often lost. Drunkenness, for instance, has occasioned a fearful battle against alcohol, and millions of dollars had been spent to prove that alcohol caused people to be hopeless drunkards and wrecks, before it was learned that drunkenness may simply be a manifestation of a diseased nervous system, while alcohol is really a food often of timely benefit when rightly used.

Apropos of this thought, there comes to mind the instance of a recent interview of a professor in one of our leading colleges, who, being interrogated as to his views regarding the researches of Professor Atwater of Wesleyan University on "The Nutritive Value of Alcohol,"

replied to the query whether he would class alcohol as a food: "If asked such a question by one of the laity I would reply no, but if asked by a scientist I must say yes." Unfortunately there is a tendency in some minds to jump at conclusions, and to this class the suggestion of food value seems to imply something which can take the place of beefsteak, while the facts of physiology clearly indicate the definition which I have formulated: *A food is any substance taken into the body which maintains integrity of the tissues and creates the energy we term life.*

Linnaeus considered that a medicine differed from a poison not so much in its nature as in its dose, and in this view food, medicine and poison may be considered as intimately allied to each other by indefinable gradations. A common example of this is illustrated in the use of certain condiments. Thus mustard, which, when applied in a small quantity to the food, gives a zest to the appetite, in a large dose acts as an irritant and provokes vomiting.

The misconception and confusion of the term stimulant originated from the teachings of those ancient philosophers who, in order to offer a physiological explanation for their theory of "vital force," established the supposition of an excitation of tissues from the irritation of stimulus, which they presumed must necessarily be followed by depression. To this has been added a modern confusion through confounding stimulants with intoxicants, which is erroneous in fact. Quickly digested food is a stimulant, a cup of hot water slowly sipped may be a stimulant, and these or *any substance which increases natural action*—which is the true definition of stimulant—will not necessarily be followed by a period of depression corresponding to the previous sense of well being. Nor does a proper stimulant irritate to fretful excitement. The true stimulant simply rouses latent energies, which may be quite capable to work if only suitable impetus be given to promote activity. One of the most able writers upon this subject [222] has placed quickly digested and nutritious food at the head of stimulants, of which all other means can but be the faint reflex. Under such action, the pulse is given increased firmness without hurry and there is less feeling of fatigue, while a grateful warmth pervades the body, accompanied by a general sense of well being. These indeed are the physiological results of a good meal or may similarly follow from the use of Coca. These facts have been interpreted by many observers, and although it is not claimed that Coca replaces beefsteak, certainly it may in emergency act as a substitute for a more ample dietary, or may advantageously be used at other times to stimulate the assimilation

222. Anstie; 1865.

and conversion of other food. It is the reconstructive action upon the tissues which forms one great benefit of the wide range of usefulness of Coca.

The action of Coca upon the heart is precisely as a regulator of that organ. If the heart's action is weak it is strengthened—if it is excessive the over-activity is toned down—if irregular the beat is made uniform. This indicates that Coca is a direct cardiac tonic. Let the heart be running riot in a palpitation from over-exertion and a teaspoonful of Mariani Thé—taken in a small cup of hot water—will speedily bring the heart's action to normal. This unique preparation of Coca is in the form of an agreeable fluid extract, said to represent in one part, two parts of the leaves, and presenting in concentrated form all the qualities of true Coca. It may be administered plain, or drunk as a tea with cream and sugar; in this latter form it has a taste resembling a rich English breakfast tea.

The especial influence of Coca upon the heart is alone sufficient to establish it as a remedy of phenomenal worth. Lieutenant Gibbs, U.S.N., from a personal experience with Coca in crossing the high passes of the Andes, considered the sustaining action of Coca in high altitudes due wholly to its enabling the heart muscle to perform the extra work then called forth.[223] Similar observations have been made by many travellers who have remarked the influence of Coca upon themselves. Recently Captain Zalinski, U.S.A.—who rendered the dynamite gun an effectual instrument of war—has been experimenting upon a concentrated ration suitable for the army. In pursuing his studies under a severe test he submitted himself to the hardships of Andean travel, and through the high altitudes used Coca Thé and Coca Pâté prepared by Mariani, the timely use of which, he assured me, had supported his life through a serious ordeal.[224] Dr. Beverley Robinson, referring to the efficiency of heart tonics [225] has written: "Among well known cardiac tonics and stimulants for obtaining temporary good effects, at least, I know of no drug quite equal to Coca. Given in the form of wine or fluid extract, it does much, at times, to restore the heart muscle to its former tone." In this connection, Dr. Ephraim Cutter says: "Coca should be more used in heart failure from direct weakness, and in many cases might well replace the conventional digitalis which advances the treatment of heart disease no more than it was forty years ago." [226] Many physicians who have corresponded with

223. Gibbs; 1875.

224. Zalinski; *person. com.;* 1899.

225. Robinson, p. 238; 1867.

226. Cutter; 1898.

me on the application of Coca have emphasized this influence from experiences in their practice. Coca is advocated to replace digitalis or to tone up the muscular structure of the heart after use of the latter, either employed alone or alternately with digitalis when that is considered essential.[227]

The effect of Coca upon respiration is analogous to its action on the heart. It acts as a regulator, not increasing respiration, but giving force to the cycle—making inspiration deeper and expiration more complete.

The observations of Mantagazza were so soon followed by Niemann's researches upon cocaine, that the mistaken conception originated that the phenomenal activity of Coca had been discovered in that alkaloid, and subsequent physiological work was almost wholly carried out upon coacaine with the resultant neglect of the parent plant. The reports of many of the earlier experimenters, however, were so contradictory as to give rise to a suspicion whether cocaine had been used at all.

Schroff was one of the first to experiment with the new alkaloid. He observed that cocaine produces a slight anaesthesia of the tongue, and gives an agreeable sense of lightness of the mind with a condition of cheerfulness and well being, followed by lassitude and an inclination to sleep. From augmented doses he remarked giddiness, buzzing in the ears, dilatation of the pupils, impaired accommodation, headache, restlessness, and a feeling as though walking upon air. The heart was first quickened and then retarded. There was no reaction from the motor nerves, and the respiration was lowered from smaller doses.[228] Demarle, who experimented about the same time with Coca, remarked the anaesthesia from chewing the leaves and the dilatation of the pupils noticed in his own person.[229]

In 1865, Dr. Fauvel, of Paris, used a preparation of Coca which had been prepared for him by Mariani as a local application, to relieve pain in the larynx, and this treatment was continued in England by Dr. Morrell Mackenzie and in the United States by Dr. Louis Elsberg, who had remarked the beneficial effects of this application in Fauvel's clinic. It seems remarkable that no general use was made of this anaesthetic property for nearly a quarter of a century after these early observations until cocaine was adapted by Dr. Carl Koller to the surgery of the eye. A great many erroneous accounts of this adaptation have been published, but I am assured this gentleman never wrote nor authorized any writing upon cocaine except the preliminary paper and his principal paper before the *Gesellschaft der Arzte* at Vienna,

227. See Heart, *Collective Investigation,* in Appendix.

228. Schroff; 1862.

229. Demarle; 1862.

and later his article in the *Reference Handbook*,[230] but in none of these is given the details which led to the surgical uses of cocaine.

At the period of his experiments Dr. Koller was *Sekundärarzt*, or house surgeon, on the staff of the *k. k. Allgemeinen Krankenhauses*, the largest hospital of Vienna, which serves also as a clinic for the medical faculty of the University. Through his connection with Professor Stricker he had been interested in experimental physiology and pathology and had made considerable research in the action of poisons upon the circulation. His investigations upon cocaine were therefore in a similar nature to those with which he was familiar. In August, 1884, Dr. Sigmund Freud and Dr. Joseph Breuer, of the University of Vienna, treated a prominent physiologist for morphinism by the use of cocaine, which had about then been prominently advocated in American literature. Several of the hospital staff were induced to try the effects of the alkaloid upon themselves. Among these was Dr. Koller, who, from a dose of the salt taken internally, remarked the benumbing action upon the tongue which had already been recorded by other observers. He had before been looking for a local anaesthetic, and with this in view had experimented with morphine, chloral, the bromides, and a number of other substances, so when he experienced the numbness from cocaine he realized he had found the sought-for anaesthetic, and experimented to determine its utility in ophthalmology.

It has been asserted that this discovery was made accidentally, and the story is related that a student had in mistake applied a solution of cocaine to the eye of a friend, when instead of the irritation feared from this carelessness, the property of dilatation and anaesthesia was found. Dilatation of the pupil had previously been noted from cocaine, but anaesthesia could hardly be observed accidentally, and, indeed, was determined not by local but by physiological experimentation. It had been known that the action of Coca through the circulation contracts the peripheral arteries, also that it dilates the pupil. Tschudi wrote: "After mastication of a great quantity of the Coca the eye seems unable to bear light and there is marked distention of the pupil," [231] an effect which had also been noted by many other observers.[232]

Koller's experiments were carried out in the laboratory of Professor Stricker upon guinea pigs. It was found that a minute quantity of a solution of hydrochlorate of cocaine dropped in the conjunctival sac, produced such complete local anaesthesia that the cornea could be

230. *Reference Handbook of Medical Sciences*, Vol. IX, p. 175; New York, 1894.

231. Tschudi; 1840.

232. Schroff; 1862. Ott; 1876. Anrep; 1880.

irritated with needles and electric currents and cauterized with nitrate of silver until it became opalescent. This experiment suggested that anaesthesia was not merely upon the surface but involved the entire thickness of the cornea. After experimenting upon animals the investigator applied cocaine to his own eye and examined the efficiency of the anaesthetic in diseased eyes. A preliminary paper upon the result of this discovery was sent to the annual meeting of the *Deutsche Ophthalmologiche Gesellschaft,* held at Heidelberg Sept. 15–16, 1884, which was read by Dr. Brettauer of Trieste. With this paper was a vial containing a few grammes of cocaine, which was all of the alkaloid that Merck could furnish at that time.[233] Meantime Koller continued his experiments and asked specialists in other departments to employ the alkaloid in their practice, for though satisfied that he had found a local anaesthetic adapted to the surgery of the eye, he believed that it was also suited to other special uses, a fact soon confirmed by several observers who based their researches upon this original investigation. This, briefly, is the story of the adaptation of this alkaloid of Coca to minor surgery, which is modestly all the merit of "discovery" that is claimed by the one through whom cocaine has been made a boon to suffering humanity, fully as important, and in many cases superior to the great anaesthetics, chloroform and ether.

When a two per cent solution of cocaine is applied to the eye there is at first a slight irritation, followed by a drying of the secretions. The pupil is dilated and the eye has a staring look, occasioned from a wider opening of the lids. Anaesthesia continues for about ten minutes, followed by a stage of reduced sensibility, slowly passing into the normal condition. Dilatation reaches the highest stage within the first hour, decreases considerably in the second hour, and then soon disappears entirely. The pupil is never at a maximum dilatation; that is, it may always be further dilated with atropine, and still responds to light and convergence. The dilating power of cocaine combined with atropine is invaluable when used in cases of iritis, the combination counteracting both the muscular spasm and the local congestion. In this condition Koller uses equal parts of a five per cent solution of hydrochlorate of cocaine, with a one per cent solution of sulphate of atropine. After the dilatation following a few applications the solution is used three times a day.

At first it was supposed that local anaesthesia from cocaine was due to anaemia of the minute vessels, but it was found that though anaemia followed an application of the alkaloid the anaesthesia preceded this

233. Koller; *person. com.;* Aug. 25; 1899.

influence.[234] That the benumbing action was not only local but might be general through the circulation was subsequently shown by the subcutaneous injection of a solution of the salt. Half a grain of hydrochlorate of cocaine so used occasioned a slight general anaesthesia,[235] while repeated injections of small doses caused a general reduction of tactile sensibility, with the sensation as though standing on cushions.[236] This was similar to the floating in the air experience of Mantegazza from large doses of Coca, and is in accord with the observation of Schroff with cocaine. The symptom is due to a lessened power of conduction in the cord.

From an injection of 0.001 gramme of hydrochlorate of cocaine under the skin of the abdomen of a monkey, not only local but general anaesthesia was produced which lasted for eighteen minutes without loss of consciousness.[237] It has been suggested that absence of tactile sensibility may give rise to the impression in the observer that consciousness in the subject is lost. From the fact that a subcutaneous injection of cocaine at any point eases pain, it has been presumed that the action must be central as well as local.[238] But general anaesthesia has been shown to follow only from very large doses.[239] While diminished sensibility may presumably be induced from a central cause,[240] the fact has been pointed out that lessened conduction in the cord is a more potent factor in diminishing the general sensibility than any narcotic action upon the brain.[241]

Cocaine has not only the property of exciting the brain, but the special senses may be inhibited by a dose sufficient to paralyze their terminal nerve endings. Thus powdered hydrochlorate of cocaine blown into the nostrils first occasions increase and then total abolition of the sense of smell.[242] Koller observed that an injection of cocaine solution in the orbit occasioned loss of light in an eye he was about to remove.

It has been remarked by physiologists in experimenting with alkaloids that there is a relation between the constitution of the chemical

234. Alms; 1886.
235. Da Costa; 1884.
236. Hepburn; 1884.
237. Grasset; 1884.
238. Livierato; 1885.
239. Laffont; 1887.
240. Laborde; 1885.
241. Stockman; 1889.
242. Zwaardemaker; 1889.

molecule and the physiological action. The introduction of methyl into the molecule of strychnine, brucine and thebaine changes the convulsive action of these substances on the spinal cord to a paralyzing one exerted on the ends of the motor nerves.[243] Probably any of the organic alkaloids in which methyl and ethyl enter would paralyze both muscle and nerve, the latter before the former, the symptoms varying in accordance with the order in which different parts of the nervous system may be affected. The activity depends also upon the affinity which the substance may have for certain tissues which through alteration of function may affect the organism, and this accounts for the difference manifest between a large and a small dose. This is illustrated by atropine and by curare, either of which paralyze motor nerves, but while a very large dose of curare is necessary to paralyze the cardiac and vascular nerves a small dose paralyzes the nerves going to the muscles. On the other hand, an enormous dose of atropine is required to paralyze the motor nerves, but a very small dose is sufficient to affect the nerves of the heart and other involuntary muscles, and thus we get rapid circulation, dilated pupil and restless delirium.[244] The influence of these radicals in the Coca bases has already been referred to.[245]

The researches of several investigators indicate that cocaine is a protoplasmic poison, first stimulating, then paralyzing the vital functions, but it is possible to regulate this action so that the functions may be either increased or held in check even in minute organisms. The motion of amoebae in normal salt solution was stopped by a two per cent solution of cocaine and the movement of spermatozoids and of ciliated cells was checked by stronger solutions.[246] Claude Bernard long since explained that cell metabolism in the lower organisms—in which the contractile protoplasm fulfills both the function of nerve and of muscle—may be suppressed by chloroform narcosis, the phenomenon being identical with that observed in anaesthesia of animals. In such anaesthesia there is inhibition of cell activity and not necessarily death of cell substance. He has shown by experiment upon plants that while growth and cell division ceases when under the influence of the anaesthetic, vitality is resumed when the plant is again under normal healthful conditions.[247] This influence follows upon the use of cocaine. The cell life is first stimulated and if the

243. Brunton; p. 50; 1885.

244. *Idem;* p. 48.

245. See also Ehrlich; 1890; and Poulsson; 1892.

246. Albertoni; 1890.

247. Bernard; 1879.

dose is increased there is inhibition, but activity is resumed upon the withdrawal of the drug. Similar results were obtained in my research made in the laboratory of the botanical department of Columbia University. It was found that both Coca and cocaine have a marked stimulating influence upon the lower organisms.[248]

My experiments were made with *infusoria*, yeast, *penicillium* and the aquatic plant *Elodea*, which latter forms a common substance for illustrating in the laboratory the effect of metabolism as represented by the bubbles of oxygen given off under the action of various stimuli. Portions of this plant exposed in test tubes to similar conditions of water, temperature and sunlight exhibited under the influence of Coca a stimulated metabolism as shown by the relative increase of bubbles, from twenty in twenty-eight seconds in the standard, to twenty in seven seconds in the tubes to which small portions of Coca Thé or solution of cocaine had been added. A similar result was obtained from the increased growth of the yeast plant in a solution of sugar, as indicated by the decomposition of the carbohydrate.

In each of four graduated test tubes there was placed fifteen cubic centimetres of a solution of sugar and yeast. One of these was left normal. To the others there was added respectively one, two and three cubic centimetres of a one per cent solution of cocaine. The relative activity of metabolism was increased above the standard, twenty-five per cent, fifty per cent, and twenty-five per cent, the latter indicating the excitation limit for these particular organisms had been passed.

In considering the action of any of the Coca alkaloids on man, it may be well to suggest that possibly one cause of conflicting testimony may have resulted from reporting the influence of the alkaloid upon animals, the effects of which are not always uniform with their action on man. In experiments upon animals those symptoms which follow doses full enough to create some outward sign are alone seen, while the agreeable exaltation such as would be experienced in man from a relatively much smaller dose can not be appreciated. A dose of cocaine which in one of the lower animals would cause depression, would under the controlling influence of a greater cerebral development in man occasion exhilaration, an effect probably resulting from inhibition of certain of the brain cells, thus inducing slight loss of co-ordination similar to that following a small dose of opium or alcohol. Both alcohol and opium seriously disturb the normal relations of one part of the brain with another, the nerve centers being paralyzed in the inverse order of their development. The primary ex-

248. In these experiments I used Coca Thé and Wine of Coca of Mariani, hydrochlorate of cocaine of Boehringer and Soehne, and cocaine of Merck.

hilaration being succeeded by a narcotic action when the inhibitory paralysis permits the emotions full sway. Coca, however, appears to stimulate the brain by an harmonious influence on all the brain cells so the relation of its functions is not deranged.

The action of cocaine has been placed midway between morphine and caffeine. In man the initial effect of Coca is sedative, followed by a rapidly succeeding and long continued stimulation. This may be attributed to the conjoined influence of the associate alkaloids upon the spinal cord and brain, whereby the conducting powers of the spinal cord are more depressed than are the brain centers. In view of these physiological facts it is unscientific to regard strychnine as an equivalent stimulant to Coca or a remedy which may fulfill the same indications, as erroneously suggested by several correspondents. For immediate stimulation Coca is best administered as a wine, the mild exhilaration of the spirit giving place to the sustaining action of Coca without depression.

The action of Coca and cocaine, while similar, is different. Each gives a peculiar sense of well being, but cocaine affects the central nervous system more pronouncedly than does Coca, not—as commonly presumed—because it is Coca in a more concentrated form, but because the associate substances present in Coca, which are important in modifying its action, are not present in cocaine. The sustaining influence of Coca has been asserted to be due to its anaesthetic action on the stomach [249] and to its stimulating effect on brain and nervous system. But the strength-giving properties of Coca, aside from mild stimulation to the central nervous system, are embodied in its associate alkaloids, which directly bear upon the muscular system, as well as the depurative influence which Coca has upon the blood, freeing it from the products of tissue waste. The quality of Coca we have seen is governed by the variety of the leaf, and its action is influenced by the relative proportion of associate alkaloids present. If these be chiefly cocaine or its homologues the influence is central, while if the predominant alkaloids are cocamine or benzoyl ecgonine, there will be more pronounced influence on muscle. When the associate bodies are present in such proportion as to maintain a balance between the action upon the nervous system and the conjoined action upon the muscular system, the effect of Coca is one of general invigoration.

It seems curious, when reading of the marvelous properties attributed by so many writers to the influence of Coca leaves, that one familiar with the procedure of the physiological laboratory should have arrived at any such conclusion as that of Dowdeswell, who experi-

249. Gazeau; 1870.

mented with Coca upon himself. After a preliminary observation to determine the effect of food and exercise he used Coca "in all forms, solid, liquid, hot and cold, at all hours, from seven o'clock in the morning until one or two o'clock at night, fasting and after eating, in the course of a month probably consuming a pound of leaves without producing any decided effect." It did not affect his pupil nor the state of his skin. It occasioned neither drowsiness nor sleeplessness, and none of those subjective effects ascribed to it by others. "It occasioned not the slightest excitement, nor even the feeling of buoyancy and exhilaration which is experienced from mountain air or a draught of spring water." His conclusion from this was that Coca was without therapeutic or popular value, and presumed: "The subjective effects asserted may be curious nervous idiosyncracies." [250] This paper, coming so soon after the publication of a previous series of erroneous conclusions made by Alexander Bennett,[251] created a certain prejudice against Coca. Theine, caffeine and theobromine having been proved to be allied substances, this experimenter proceeded to show that cocaine belonged to the same group. As a result of his research he determined that "the action of cocaine upon the eye was to *contract* the pupil similar to caffeine," while the latter alkaloid he asserted was a *local* anaesthetic; observations which have never been confirmed by other observers. In view of our present knowledge of the Coca alkaloids, it seems possible that these experiments may have been made with an impure product in which benzoyl-ecgonine was the more prominent base. However, the absolute error of Bennett's conclusions has been handed down as though fact, and his findings have been unfortunately quoted by many writers, and even crept into the authoritative books. Thus Ziemssen's *Cyclopaedia of the Practice of Medicine,* which is looked upon as a standard by thousands of American physicians, quotes Bennett in saying: "Guaranine and cocaine are nearly, if not quite, identical in their action with theine, caffeine and theobromine." [252] The *National Dispensatory* refers to the use of Coca in Peru as being similar to the use of Chinese tea elsewhere—as a mild stimulant and diaphoretic and an aid to digestion—which are mainly the properties of coffee, chocolate and guarana, and Bennett is quoted to prove that the active constituents of all these products: "Although unlike one another and procured from totally different sources possess in common prominent principles, and are not only almost identical in chemical composition, but also appear similar in physiological

250. Dowdeswell; 1876.

251. Bennett; 1873.

252. Vol. XVIII; p. 181.

action." [253] These statements, which are diametrically opposed to the present accepted facts concerning Coca, are not merely a variance of opinion among different observers, but are the careless continuance of early errors, and suggest the long dormant stage in which Coca has remained, and has consequently been falsely represented and taught through sources presumably authentic.

As may be inferred from its physiological action, Coca as a remedial agent is adapted to a wide sphere of usefulness, and if we accept the hypothesis that the influence of Coca is to free the blood from waste and to repair tissue, we have a ready explanation of its action. Bartholow says: [254] "It is probable that some of the constituents of Coca are utilized in the economy as food, and that the retardation of tissue-waste is not the sole reason why work may be done by its use which cannot be done by the same person without it." Stockman considers that the source of endurance from Coca can hardly depend solely upon the stimulation of the nervous system, but that there must at the same time be an economizing in the bodily exchange, an idea which is further confirmed by the total absence of emaciation or other injurious consequences in the Indians who constantly use Coca. He suggests that Coca may possibly diminish the consumption of carbohydrates by the muscles during exertion. If this is so, then less oxygen would be required, and there is an explanation of the influence of Coca in relieving breathlessness in ascending mountains.

Prominent in the application of Coca is its antagonism to the alcohol and opium habit. Freud, of Vienna, considers that Coca not only allays the craving for morphine, but that relapses do not occur.[255] Coca certainly will check the muscle racking pains incidental to abandonment of opium by an habitué, and its use is well indicated in the condition following the abuse of alcohol when the stomach can not digest food. It not only allays the necessity for food, but removes the distressing nervous phenomena. Dr. Bauduy, of St. Louis, early called the attention of the American Neurological Association to the efficiency of Coca in the treatment of melancholia, and the benefit of Coca in a long list of nervous or nerveless conditions has been extolled by a host of physicians.[256] Shoemaker, of Philadelphia, has advocated the external use of Coca in eczema, dermatitis, herpes, rosacea, urticaria and allied conditions where an application of the Fluid Extract

253. *National Dispensatory;* 5 ed.; 1896.

254. Bartholow, p. 467; 1885.

255. This, of course, subsequently proved to be erroneous.—Eds.

256. See Sajous' *Annual,* Vol. V, A36; 1891.

of Coca one part to four of water lends a sedative action to the skin. The influence of Coca on the pulse and temperature has suggested its employment in collapse and weak heart as recommended by Da Costa,[257] and it has been favorably employed to relieve dropsy depending on debility of the heart, and for uraemia and scanty secretion of urine. In seasickness Coca acts as a prophylactic as well as a remedy. Vomiting of pregnancy may be arrested by cocaine administered either by the mouth or rectum. In the debility of fevers Coca has been found especially serviceable, and in this connection Dr. A. R. Booth, of the Marine Hospital Service, at Shreveport, Louisiana, has written me that he considers cocaine one of the most valuable aids in the treatment of yellow fever.[258] (1) By controlling nausea and vomiting, (2) as a cardiac stimulant, (3) as a haemostatic when indicated, (4) to hold in abeyance hunger, which at times would be intolerable but for the effect of cocaine. One who has seen a yellow fever stomach, especially from a subject who has died from "black vomit," must have been impressed with the absolute impossibility of such an organ performing its physiological functions. Dr. Booth makes it an inflexible rule, never to allow a yellow fever patient food by the mouth until convalescence is well established. In cases of fine physique he has kept the patient without food for ten or twelve days, and in two cases fourteen and fifteen days respectively, solely by the judicious administration of cocaine in tablets by the mouth. Of two hundred and six cases of yellow fever treated in this manner there was not one relapse. A similar use is made of cocaine to abate the canine hunger of certain cases of epilepsy and insanity, as well as to appease thirst in diabetes.

The Peruvian Indians employ Coca to stimulate uterine contractions and regard it as a powerful aphrodisiac. Leopold Casper, of Berlin, considers Coca one of the best of genital tonics,[259] and many modern observers concur in this opinion.[260] Vecki [261] says that cocaine internally to a man aged fifty-six invariably occasioned sexual excitement and cheerfulness. The Homoeopaths who have long regarded Coca as a valuable remedy, employ Coca in sexual excesses, especially when dependent on onanism. Allen has given a "proving" of Coca that covers twelve pages, and Hering's Materia Medica gives provings by twenty-four persons, and recommends Coca in troubles coming with a a low state of the barometer. Hempel says: "I have found a remarkable

257. *Medical News,* Dec. 13, 1884.

258. Booth, *person. com.;* Jan. 15, 1898.

259. *L'Union Medicale du Canada,* p. 443; 1890.

260. See also Hamilton, *Virginia Med. Monthly;* Oct. 1891.

261. Vecki; 1899.

aversion to exertion of any kind in consequence of nervous exhaustion frequently relieved with great promptness by Coca." But it is not my intention to here enumerate the various symptoms for which Coca is regarded as a specific. I have only space to briefly suggest its possible application as a remedy. A résumé of the various conditions in which Coca has commonly been found serviceable, and its relative employment as classified from the experience of several hundred physicians, correspondents in this research, will be found tabulated in the appendix. Coca may be given in doses equivalent to one or two drachms of the leaves three or four times a day, either as an infusion or as a fluid extract or wine; the latter especially being serviceable for support in acute disease as well as an adjunct indicated in those conditions where its use may tend to maintain the balance of health.

It is a noteworthy fact already referred to, that there has been no recorded case of poisoning from Coca, nor cases of Coca addiction commonly regarded as "habit." Certainly the very general use of cocaine as an anaesthetic has not resulted relatively in anything like the number of rare accidents from the use of chloroform and ether, and this fact must appear the more remarkable when it is appreciated that chloroform and ether are administered under skilled observation, while cocaine is commonly employed by hundreds of thousands—even millions—of laymen, many of whom are absolutely ignorant of its properties.

The use of any alkaloid should be with the appreciation that the factor of personal idiosyncrasy may exert an influence to occasion irregular action. A case of fatal poisoning has been recorded against cocaine from as small a dose as two-thirds of a grain of the hydrochlorate given hypodermically, and from twenty minims of a four per cent solution (four-fifths of a grain) of the same salt injected into the urethra, and smaller doses it is asserted have produced alarming symptoms. On the other hand, numerous cases are recorded where excessive doses of the alkaloid have been continued for long periods without giving rise to serious trouble. A recovery is recorded after forty-six grains of cocaine had been taken into the stomach, and in one case twenty-three grains of cocaine was used hypodermically daily.[262]

Dr. Caudwell, of London, experimented upon himself with both Coca and cocaine. He took increasing doses of fluid extract of Coca until two ounces were taken at a dose. From this he experienced giddi-

262. Mann; 1898.

ness with unsteadiness of gait, followed by sensations of mental and physical activity when it seemed any exertion could have been undertaken without difficulty. Under cocaine, in doses of one grain he experienced drowsiness, followed by sleep, and then persistent insomnia. Two and a half grains produced frontal headache, mental excitement and marked insomnia. Three grains after abstinence from food for twenty-four hours produced drowsiness, slight vertigo and wakefulness with a sense of well being. On the following morning five grains produced giddiness with a supra-orbital headache and a sense of weight at the pit of the stomach, while the pupils were widely dilated, and there was inability for exertion. All unpleasant sensations following this experiment had passed in two hours, though dilatation of the pupils lasted for six hours.[263] Professor Bignon, of Lima, considers that the Peruvian Indians consume daily an amount of Coca which represents from thirty to forty centigrammes—(4.5 to 6. grains) of cocaine. He regards ten centigrammes of that alkaloid per day (1.5 grains) a good average dose for those unaccustomed to its use. The average initial dose of cocaine hypodermically should not exceed a quarter of a grain. Under a moderate dose of cocaine, the central nervous system is stimulated through a direct action on the nerve cells. There is psychic exaltation, with increased capacity for mental work, which passes off in a few hours and is followed by complete restoration to the normal condition without after depression. Indeed, whatever depression there may be precedes the exaltation. From larger doses, the medulla and the sensory columns of the spinal cord may be directly affected, but only after very large doses is there weakness and lassitude, and general anaesthesia can only follow from an excessive dose.

Under a poisonous dose of cocaine there is an initial increase of respiration and of the heart beat, both of which soon slow under the influence of paralysis of the vaso motor center, this effect of cocaine upon respiration and the circulation being similar to that from atropine. The pupils are widely dilated and do not respond to light. Involuntary movement of the muscles of mastication, as in chewing, and rotation of the head or body has been noted in animals. There may be epileptiform attacks, clonic convulsions or tetanus. The most common symptoms of cocaine poisoning are those of profound prostration, with dyspnoea, pallor, cyanosis and sweat. When the drug has been taken by the stomach that organ should be evacuated and washed out, while in any case stimulants may be indicated, such as nitrite of amyl, ammonia, ether hypodermically, chloroform to check spasm of

263. Caudwell; 1885.

the respiratory muscles and even artificial respiration may be indicated. After the severe symptoms have passed chloral may be administered. Both chloral and morphine are regarded as antagonistic to cocaine. Recovery may take place even after a long period of unconsciousness. I was called in one case to a dentist's office to resuscitate a patient after his careless injection of an unknown quantity of cocaine, and we labored over the subject eight hours before consciousness was restored.

Mannheim,[264] from a collection of about a hundred cases of cocaine poisoning—of which nine were fatal—has determined that one gramme (15.43 grains) of the alkaloid may be considered a fatal dose in man. A "cocaine habit," as already referred to, is not generally accepted. Yet symptoms presumably due to the excessive use of large doses of cocaine are described. These embrace frequency of pulse, relaxation of the arterial system, profuse perspiration, rapid fall of flesh and hallucinations of sight or feeling.[265] A peculiar symptom of chronic cocaine poisoning is that known as Magnan's symptom, after the name of the describer. It is an hallucination of sensation in which the patient complains of feeling a foreign body under the skin.[266] While other hallucinations are common from poisons this is said to be distinctive of cocaine.

There is but one further feature in the physiological study of Coca that we have to consider, and that is the manner of its elimination from the body. From experiments of Dr. Helmsing [267] it was long since determined that cocaine is very difficult of detection in animal tissues. This may be appreciated when the important role which it is possible that Coca plays in assimilation is considered. When taken into the stomach Coca soon disappears from the alimentary canal, being decomposed and gradually setting free the products to which its physiological action is due. As these several alkaloids are carried through the tissues, they enter into further chemical change whereby they are still further broken down, and only soon after the administration of a very large dose is it possible to recover the bases from the alkaline urine with benzoyl. Immediately after a poisonous dose of cocaine given to a cat there was found a distinctive reaction in the urine and blood, but a diminished dose gave after a longer interval only faint tracings, which gradually disappeared.[268] Because of this difficulty of

264. Mannheim; 1891.

265. Obersteiner and Erlenmeyer; p. 483; 1896.

266. This is now known as formication.—Eds.

267. *Thesis,* Dorpat; 1886.

268. *Journ. Chem. Soc.;* 1891.

detection the decomposition products of Coca, chiefly as ecgonine, are determined post-mortem by a process of assay.

The fact that the Coca products are so thoroughly consumed in the body indicates the important influence these substances exercise in nutrition.

ADAPTATION OF COCA TO VOICE PRODUCTION

So much has been written in regard to the action of Coca in voice production, that it may be said its praise and its effects have literally been sung. Its use has been so pronouncedly successful in the treatment of laryngeal troubles generally that it seems appropriate to say something as to the organs which govern voice and of the application of Coca to their benefit.

The organ of voice—one of the greatest gifts to man—is a natural instrument to which cleverness and skill may only hope to harmonize other musical instruments. And just as we have seen, there has been a gradual growth of musical expression as the development of musical taste and knowledge was improved, so the singing voice has been slowly evolved with the scientific unfolding of the principles of tone formation which has been marked by the elaboration of fixed means of musical expression.

In a similar manner to that in which a vibrating string gives forth a note, the human voice produces tones by the vibration of two membranous folds—really the ligamentous edges of two muscles. These are attached at their outer borders, while their free margins—pearly white in color—are movable, and may be approximated or opened more widely, leaving a narrowed slit between, termed the *rima glottidis,* or "vocal chink." In the adult man these folds—or vocal cords, are about three-quarters of an inch in length, and in women they are some quarter shorter, while situated on a higher plane. To this variation in size and position, as well as to a slight difference in the shape of the vocal box, is due the range and quality between the male and the female voice. The female voice has three registers, while the male voice has but two, though having the greater number of over-tones.

The delicate cords which give rise to voice are within the larynx, a triangular cartilaginous box constituting the protuberance in the neck known as "Adam's apple." This vocal box is between the pharynx above and the trachea below, surrounded by muscles and lined with mucous membrane which is closely adherent to the vocal cords, and is continuous with that lining the entire respiratory tract. Because of this continuity when any part of this membrane is diseased other parts

of the respiratory tract may suffer. This indicates why applications to the cavity of the nose may improve voice, or why sipping Coca wine, as commonly advocated among vocal instructors, will give tone to the vocal cords although not actually coming in contact with them.

The direct influence of Coca upon the mucous membrane of the larynx long since gave it importance as a tensor of the vocal cords,[269] and in throat troubles generally it has received a wide application among professional singers and speakers. It is used as a tonic to the mucous membrane[270] and to render tone more clear,[271] giving an improved quality to the upper voice,[272] as well as to sustain tone.[273] Several correspondents report the beneficial action of Coca in aphonia,[274] a result that has been attributed to general improvement of health following its use.[275]

One of the most pronounced influences of Coca is its power upon respiration.

Each portion of the respiratory tract is liable to its particular derangement, the most common of which results from the congestive trouble commonly termed catching cold. In the upper tract this condition is frequently manifest through annoying catarrhal troubles, probably resulting from a persistent relighting of chronic local derangement in the nose or throat, or from an acute congestion. As a consequence the mucous membrane is swollen and gives out an increased secretion, a condition which may even be conveyed through continuity of tissue to the larynx or bronchial tubes. Here the effect of Coca is marked in lessening the profuse secretion by constringing the blood vessels, while the muscular system is toned to favor repair.

When the malarial-bone-racking accompaniment of influenza known as grip raged, Coca was found the most serviceable supporter of the organism during an attack. The use of grog made from "Vin Mariani" and hot water taken at bed time was recommended abroad by Dr. H. Libermann, surgeon-in-chief of the French army, and in the United States by Dr. Cyrus Edson.[276] Personally, I advocate in this affection quinine combined with phenacetine—three grains of each, repeated at intervals of two or three hours, with at the same time a tablespoonful

269. Fauvel; also *Collective Investigation;* 511. See Appendix.

270. *Idem;* 143, 289, 366, 563, 593, 658, 1131.

271. *Idem;* 311.

272. *Idem;* 148, 537.

273. *Idem;* 274, 1074.

274. *Idem;* 339, 365, 982.

275. *Idem;* 629.

276. Edson; p. 39; 1891.

to a wineglassful of the wine already mentioned. Quinine has a very depressing influence upon many patients and is apt to check the flow of bile as well. Coca, on the other hand, is mildly laxative, and while furthering the action of the antifebrile remedies, it antagonizes the disease, buoys the patient and serves as a nutrient when food and even a milk dietary is distasteful. When the acute condition has passed the Coca wine used less frequently may wholly replace other medication, checking the fearful incidental despondency and toning up the patient to recovery.

Asthma is an exceedingly unfortunate affliction which may exhibit no local signs between the attacks. It is occasioned by a spasm of the minute tubes set up reflexly either by trouble in the upper air passages, or wholly from a nervous influence, and an attack is often precipitated by worry or some unusual nervous strain. The source of trouble is well prevented by the judicious use of Coca, not only acting beneficially upon the mucous membrane, but through a sedative influence upon nervous tissue and as a tonic support to the muscular system generally.

The tenor Gunz is said to have been able to take sufficient air at one inspiration to sing all of Schumann's "The Rose, the Lily," and an Italian songstress is mentioned who could trill up and down the chromatic scale through two octaves with one breath.

Artists who appreciate the importance of a sound body in order to render desirable tones take especial care to carry out a line of general exercise which, while improving the physique, may be recreative. Following the idea that work, not idleness, is the more restful, a change of occupation is sought, and the same impulse which led Gladstone to tree chopping for his rest has prompted several prominent singers to stock farming. Professional singing is not the dreamy, idle life which the poetry of music suggests, but calls forth all the powers of a sound organism. Indeed, the exertion, and consequent exhaustion of both nerve and muscle, is greater than commonly supposed in all prolonged use of the voice, either in singing or speaking. Meyerbeer was termed a voice breaker as far back as 1837; since his day the task of such artists as sing the Wagnerian music is really phenomenal, and they deserve credit as noble examples of endurance quite as much as for their cultivated rendering of harmony. It is not unusual for singers to break down physically, so the professional singer's care is constantly excited to the preservation of health. A story is related of a lady who went to Bayreuth to rehearse under Wagner the part of one of the flower girls in "Parsifal." The great composer told her to sing the high note loud and take the next deep note, which immediately followed, from the chest. She replied: "Why, *Meister,* if I do, I will have no voice

left in two years," to which it is said Wagner replied: "Well, do you expect to sing any longer than that?"

From the particular strain put upon the vocal organs through prolonged periods there is a constant liability among those who use their voice in such a way, to "relaxed throat" and hoarseness, and this, with tonsillitis and sore throat, which may be prompted by either a climatic change or any personal indiscretion, is the *bête noire* of the professional singer and speaker. Perhaps greater prominence has been given Coca preparations for the treatment of such functional derangements of the throat and voice than its application to any other use. Years before cocaine came into general utility Dr. Charles Fauvel, of Paris, directed attention to the importance of Coca for laryngeal troubles, while its use was speedily advanced in England by Dr. Morell Mackenzie and in the United States by Dr. Louis Elsberg, the father of American laryngology. Both of these gentlemen were in the clinic of Fauvel, and their methods were soon adopted by a host of skillful workers. Among those quoted as having used Coca successfully in laryngeal troubles are Lennox Browne, Beverley Robinson, Jarvis, H. H. Curtis, E. Fletcher Ingals, Solis Cohen, Sajous, Bosworth, Rice, and a host of other prominent laryngologists.[277] As has been shown, however, the effect of Coca is not in any sense merely a local one, but systemic, and its benefit is wholly dissimilar to that resulting from the topical application of cocaine, for Coca not only acts as a purifier of the blood, but through this influence as a nerve and muscle tonic.[278] This is exhibited through the empirical use of Coca long resorted to in mountain climbing.

It is a modern scientific theory that most functional derangements are due to a loading up of impurities from the blood or stored in the tissues, which have originated from a long-continued impropriety in living, and are made manifest through some aggravating indiscretion. If the hypothesis be true that Coca frees the blood of products of waste, this affords ample explanation of properties attributed to Coca which have hitherto appeared phenomenal, and its widespread usefulness and seemingly contradictory action over a host of apparently dissimilar conditions may be well understood. Whether the relief sought be for a simple vocal strain, for rheumatism, or for mountain sickness, nervous irritability or muscular fatigue, the conditions are of common origin. Coca simply makes better blood and a healthy blood makes healthy tissues.

From a review of the opinion of many physiologists it is difficult to

277. Sajous' *Annual,* Vol. V, A35; 1891.

278. Santa; 1891. See also *Collective Investigation,* in Appendix.

give a concise definition of a food. In accordance with the theory here advocated I will thus define it: *Food is any substance taken into the body which maintains integrity of the tissues and creates the energy we term life.* With such a definition in view, it may the more readily be appreciated that it is not necessarily what is eaten but what is assimilated that is beneficial. It is somewhat as Froude has said of knowledge: "The knowledge which a man can use is the only real knowledge." So the food which the body utilizes is the only real food.

There is an increased flow of saliva from chewing Coca which is not wholly dependent upon mastication, but the function is increased through physiological action. This may be the starting point of its beneficial influence in the conversion of starchy foods which is ultimately pronouncedly effective in the building up of muscular tissue. Then through its action upon the gastric secretions Coca furthers the digestive process instead of checking it by any anaesthetic action on the stomach, as has been erroneously suggested and as is commonly supposed. In this relation Dr. Weddell says: "I can affirm very positively that Coca, as it is taken habitually, does not satiate hunger. This is a fact of which I have convinced myself by daily experience. The Indians who accompanied me on my journey chewed Coca during the whole day, but at evening they filled their stomachs like fasting men, and I am certain I have seen one devour as much food at a single meal as I should have consumed during two days."

A host of modern observers have recognized the true food value of Coca in nutrition, particularly serviceable in the emergency of protracted fevers or in debility until other food may take its place, and life has been prolonged for long periods under the exclusive use of Coca during the enforced abstinence from other food. Rusby found that Coca allays the hunger sense, but does not suspend ability, being really a tonic to digestion, while Reichert, from laboratory experiments, concluded that Coca might not only replace food, but "in case of restricted diet, or even in the entire absence of food, will enable the individual to perform as much or even more work than under ordinary circumstances." [279]

There has been an attempt to explain this influence of Coca upon the sense of hunger through an anaesthetic action on the mucous membrane of the stomach, which seems parallel to the idea that tobacco abolishes the sense of hunger through disgust by prostrating nervous action. But as Anstie says: "It is wholly improbable that agents having a depressing influence on the nervous system, such as antimony and ipecac, would relieve the feeling of weakness occasioned through

279. Reichert; October, 1890.

hunger and fatigue." [280] It should be recalled that the sense of hunger is not local, but general. It is the demand of the system for nourishment, a call for fuel in order to supply energy. The sensation is experienced by the stomach reflexly, but the demand may be fulfilled by the introduction of food into the organism through any channel. Thus the sensation of thirst which is commonly referred to a dryness in the throat may be relieved by the addition of fluid to the blood by any method. The probability is that Coca through its nitrogenous influence so affects metabolism as to enable the organism to utilize substances which might otherwise pass off as waste, just as we have seen in plant structures a similar influence under well-apportioned nitrogenous substances.

The influence of Coca upon nutrition is markedly evidenced by its physiological action, and specifically by the effect of cocaine on glycogen conversion, as demonstrated by the experiments of Ehrlich [281] on the cells of the liver of mice, which under cocaine resembled stuffed goose livers. It should be recalled that the food must be rendered soluble before it can enter the circulation, and once in the blood, if the soluble products of starch—grape sugar, and the soluble peptones from proteids can not be converted into insoluble products they will be swept out of the body through the kidneys. This is precisely what occurs in certain forms of albuminuria and glycosuiria. The conversion of similar substances in plant structures under the influence of nitrogenous compounds strongly suggests the utility of the nitrogenous Coca in the conversion of these soluble products into less soluble glycogen and proteids, and indicates a possible application of Coca to the relief of diabetes and albuminuria, disorders in which it has already been employed empirically with advantage.

Man's chief desire is to acquire strength and energy for the furtherance of his ambition, be that of a physical or mental nature. The intelligent being should base his sustenance upon this hopeful instinct. One engaged in active work in the open air usually finds appetite for the food presented without being over fastidious. Throughout the greater part of British India and China the majority of the people live largely upon rice stimulated in its conversion to muscle energy through the nitrogenous influence of a liberal tea drinking. Diametrically opposite on the globe, amidst the cold and rigors of the higher altitude of the Andes the Indian finds his powers effectively sustained by a diet of maize and nitrogenous Coca leaves. Science has verified this crude empirical experience by proving that carbohydrates con-

280. Anstie; 1864.

281. Ehrlich; p. 717; 1890.

tribute force when properly converted and that Coca not only creates mental energy, but muscular power through an actual change within the tissue cells. These are facts which it is well to remember.

As the nervous system is first to suffer from a faulty dietary, so, too, a disordered nervous organization is prone to derange the digestive functions. Modern usage has happily appointed the principal meal after the care and worry of the day is over. Pleasant surroundings at meals stimulates appetite and conversation facilitates digestion, because, aside from the emotional influence, the time is prolonged and eating is done more deliberately.

Perhaps better judgment does not commonly go far astray in these matters, still a reiteration of truths is desirable to impress the greatest good, and if anything is evolved from this it should be the fact that food is better than medicine, and that Coca is not only theoretically but practically a food. Coca, indeed, is a food not only serviceable in emergency, but a desirable adjunct to the accustomed dietary, in order to provoke an effective conversion of other food supplies into vigor and happiness.

APPENDIX

A Collective Investigation upon the Physiological Action and Therapeutic Application of Coca, Among Several Hundred Physicians

The method of this investigation was to address an autograph letter to a selected set of physicians, principally teachers in the different medical colleges, who, being informed of the nature of the inquiry, were asked to give the result of their personal observations upon the uses of Coca. With this letter was enclosed a blank of questions for convenience of recording information and a stamped envelope for reply. Five thousand such letters were sent out during the year 1897.

As a great majority of those addressed made no response at all, an additional communication was sent, the entire inquiry and correspondence numbering upward of ten thousand letters. The total of replies received from all sources was twelve hundred and six. Of this number forty-four had failed to obtain results from the preparations of Coca hitherto used by them, while many had never employed it in their practice, either because they were not familiar with it or from some vague fear or prejudice, the nature of which they could not explain. In the compilation of this report all observations, whether in favor of or opposed to Coca, are given equal prominence, for in such an investigation the negative side is quite as valuable as is the affirmative testimony. The principal objections against the use of Coca which have been advanced, are a supposed inertness of Coca through confounding it with cocoa and chocolate, or to the other extreme attributing its potency to cocaine, which was to be regarded as a subtle poison, the continuance of even the most attenuated doses of which must result in a demoralizing habit beggaring description.

The reason for this confusion has already been shown. There has been a want of direct knowledge upon Coca, for as ancient as is its use in history its scientific employment is comparatively recent, having been admitted to the United States Pharmacopoeia in 1882, and to the British Pharmacopoeia in 1885. The text books are filled with inaccuracies concerning Coca, and in many instances reflect the old superstitions and prejudices of some of the early chroniclers. It is not

then surprising that we find in the writings of some clever authors allusions to Coca as though not only similar to, but identical with, certain narcotic drugs. Thus Kipling, who is said to carefully study the subjects on which he writes—when describing preparation of opium in an Indian factory—says the opium is assayed for "morphine and cocaine, etc." * Such errors appearing in lay writings are usually passed unchallenged, yet they engender a false impression, while those errors of Poeppig, who attributed a perniciousness to the use of Coca comparable to opium, and of Dowdeswell, who declared it inert and without the exhilaration of a breath of mountain air or a draught of spring water, and the physiological conclusions of Bennett, who identified the action of Coca with caffeine, are for some unknown reason repeated as authoritative in spite of their falsity as against the testimony of many more careful observers. This misinformation must necessarily require a considerable period of time to correct. It is hoped that the earnestness and broad thoroughness of the present investigation, will establish an ample foundation of scientific fact which shall tend to place Coca in general usage.

Physiologically, Coca has been shown to be as mild as tea and coffee, while without the disadvantage of those substances, which load the blood with uric acid derivatives. Coca frees the blood of impurities and chemically exerts an influence in the formation of energy. While sufficiently mild to be popularly employed, its well directed medicinal use must prove a boon to the weak and depressed, as divine as its substance was held among the Incas.

The twelve hundred and six letters returned in answer to this inquiry were numbered consecutively as received. Of the entire list of correspondents, three hundred and sixty-nine gave some record of their observations on the physiological action and therapeutic application of Coca from experiences in their practice.

* *City of the Dreadful Night.*

RESUME OF THE ACTION AND USES OF COCA

Each observer did not note every physiological action nor specify the method of using Coca medicinally, but from the reports of the three hundred and sixty-nine correspondents who gave any detailed information the following classification is made:

Physiological Action

Appetite—	
diminished	27
increased	113
Blood pressure—	
raised	88
lowered	2
Circulation—	
stimulated	107
depressed	0
Digestive functions—	
improved	104
impaired	8
Heart—	
strengthened	117
irregular	3
Heat of skin—	
raised	36
lowered	1
Mind—	
stimulated	109
depressed	3
Muscles—	
strengthened	82
weakened	1
Nerves—	
stimulated	58
sedative	21
Nutrition—	
improved	85
impaired	4
Peripheral sensations—	
diminished	6
increased	8
Pupils and vision—	
enlarged	21
contracted	5
Secretions—	
increased	2
Bowels—	
constipated	6
relaxed	17
Mucous surfaces, secretion—	
increased	12
constringed	2
Skin activity—	
increased	13
lessened	1
Urine—	
increased	45
lessened	5
Respiration—	
deeper	14
increased	40
lowered	3
Sexual functions—	
stimulated	60
lowered	4
Sleep—	
improved	58
prevented	30
Temperature—	
increased	14
lowered	3
not influenced	3
Saliva—	
diminished	3

Therapeutic Application

Fail to get results with Coca	44	No	167
As a stimulant only	27	Yes	21
As a tonic	22	If so, was the patient subject to the formation of habit or neurotic?	
Have you noticed a tendency to formation of "habit" from the use of Coca?		Yes	14

An important matter to the statistician which must add much weight to this report is the period of observation during which these cases were noted and the preparation of Coca employed. Regard should be had, too, for the manner in which the testimony is given. In no case is it the result of any special experimentation wherein certain theories may have influenced the observation, nor has there been any effort to draw any biased testimony; but in each instance the account is taken from the case book of a physician in active practice.

Two hundred and seventy-six observers have specified in detail the form of Coca used, not in all cases confining themselves exclusively to any one preparation, though in a majority of instances the wine prepared by Mariani has been particularly referred to as embodying the true qualities of Coca.

The Mariani Album: 1884-1913

It was Angelo Mariani who found the secret of preserving coca leaves, which had been selected according to the Indian standards of quality, by steeping them in a good wine. With this master stroke he made the full virtues of the coca shrub available to the world beyond the Andes. Most of his many imitators, none of whom had anywhere near his sweeping success, used cocaine or whatever coca leaves were available cheaply on the market, not taking the trouble to select the leaves one by one with scrupulous care, as do the Indians. Thirteen de luxe volumes in the British Museum, consisting of testimonials by prominent users, illustrate the high esteem in which Mariani's Coca Wine was held. The following are only a few of the thousands of tributes and signatures from some of the most distinguished figures of the turn of the century.

Albert I (Prince of Monaco). "The users of Mariani wine have attained such prestige in the world that I do not hesitate to add my name and picture to theirs . . ."

Alphonse XIII (King of Spain)

Louis Blériot (the first aviator to fly across the English Channel, which he did in 1909). "I took the precaution of bringing a small flask of Mariani wine along with me, and it was a great help. Its energetic action sustained me during the crossing of the Channel."

Dr. Jean Charcot (son of the famous neurologist and leader of the French Antarctic Expedition of 1903). "I am convinced that Mariani wine will contribute greatly to the success of the French Antarctic Expedition."

Alexandre Dumas (the younger--he wrote many plays and novels,

was a member of the *Académie Française*). "Mariani, your sweet flasks delight my mouth."

Eleonora Duse (one of the great actresses of her time). "During a long convalescence I tried Mariani wine and found it quite effective. Thank you."

Thomas Alva Edison. "Monsieur Mariani, I take pleasure in sending you one of my photographs for publication in your Album. Yours very truly."

Emile Fabré (playwright). "A modern prayer . . . We no longer say 'Hail Mary' . . . We say 'Hail Mariani.'"

Felix Fauré (President of France)

Camille Flammarion (an astronomer who founded the French Society of Astronomers): "Solar rays in bottles."

Anatole France. "It is true that Mariani's coca wine . . . spreads a subtle fire through the organism."

George I (King of Greece)

Charles Gounod (composer of symphonies and operas). "To my good friend Mariani, beneficial revealer of this admirable coca wine from Peru, which has so often restored my strength."

Henrik Ibsen. "To Mr. Mariani. Christiania. 4.9.97."

Zadoc Kahn (Grand Rabbi of France). "My conversion is complete. Praise be to Mariani's wine!"

Cardinal Lavigerie. "Your coca from America gave my European priests the strength to civilise Asia and Africa."

Pope Leo XIII sent a gold medal to Mariani through a Cardinal with the following letter. "Rome, January 2, 1898. His Holiness has deigned to commission me to thank the distinguished donor in His holy name, and to demonstrate His gratitude in a material way as well. His Holiness does me the honour of presenting Mr. Mariani with a gold medal containing His venerable coat-of-arms."

Emile Loubet (President of France). "My regards to Mr. Mariani, who spreads coca."

Antoine, Auguste, and Louis Lumière (the three brothers who invented the cinema). "To our friend Mariani, whose wine gives us strength."

General Lyautey (the conqueror of Morocco). "Mariani wine has all my good wishes, as does everything which gives life, strength, and courage."

Sir Morell Mackenzie (the physician who founded the London Hospital for Throat Diseases and the author of a book and many articles on nose and throat ailments). "I have much pleasure in stating that I have used the 'vin Mariani' for many years. I consider it a valuable stimulant."

William McKinley (President of the United States). "Executive Mansion, Washington, June 14, 1898. My dear Sir, Please accept thanks on the President's behalf and on my own for your courtesy in sending a case of the celebrated Vin Mariani, with whose tonic virtues I am already acquainted, and will be happy to avail myself of in the future as occasion may require. Very truly yours, John Addison Porter, Secretary to the President."

Jules Massenet (musician and composer of operas). "To my friend Angelo Mariani, in grateful memory of the land of coca."

Alfred Mésières (philosopher, journalist, and member of the *Académie Française).*

> "Your generous wine warms my old age.
> It gives me for a day renewal of youth.
> I don't say it's good. I say it's perfect.
> Blessings on you for such a great boon to mankind."

Octave Mirbeau (novelist, playwright, and journalist). "To Mr. Mariani, whose coca wine gives joy to those in sorrow and hope to those in the depths of despair."

W. Golden Mortimer. "My dear Mr. Mariani, it will no doubt interest you to learn that in my collective investigation among physicians . . . more than eighty percent of those who stated the form of coca they employ specified Vin Mariani. Sincerely yours."

Mozaffer-et-Dine (Shah of Persia)

Prince Henri d'Orléans (who traveled through Tibet and S.E. Asia). "As I had lost some of my vitality while traveling, I tried your elixir, and it worked very well indeed."

Oscar II (King of Sweden and Norway). "My hearty thanks."

Peter I (King of Serbia)

Pope Pius X sent an engraving and a letter to Mariani. The letter, reproduced in Mariani's Album in the original handwriting of the Pope's secretary, says:

> His Holiness has received the bottles of coca wine sent by Signor Mariani.
>
> This indication of your devoted respect has been really welcomed by His Holiness, who has asked me to let His pleasure be known to yourself and ask you at the same time to thank the same donor in name of His Holiness Himself. I am sure you will be eager to fulfill such a high wish.
>
> I am yours faithfully

Henri Poincaré (mathematician and member of *Académie des Sciences* and *Académie Française).* "20 Mariani = 100 T."

Edmond Rostand (playwright). "I always keep a flask on my work table."

Auguste Rodin. "To Mariani, who spreads coca. Your friend."

Sully-Prudhomme (poet and philosopher). "You rejuvenate faces by at least a quarter of a century."

Jules Verne. "Since a single bottle of Mariani's extraordinary coca wine guarantees a lifetime of a hundred years, I shall be obliged to live until the year 2700! Well, I have no objections! Yours very gratefully."

H. G. Wells drew two little cartoons of himself, before (slouching and depressed) and after (radiant and elated) drinking Mariani's wine.

Cocaine and the So-called Cocaine Habit

William Alexander Hammond was one of the leading neurologists of his time. The value of his work was recognized in scientific circles all over the world. At this historic meeting of the New York Neurological Society in 1886, he described his cocaine experiences with exuberance. This glowing enthusiasm was not shared by a number of his colleagues present at the meeting, as the exchange of opinions after he concluded his statement demonstrates. The following transcript was originally published in the New York Medical Journal.

DR. W. A. Hammond made some remarks upon his personal experience with some of the preparations of cocaine. He had used only the fluid extract and various wines of coca and hydrochloride of cocaine. The fluid extract had been discarded by him for the last two or three years, mainly because it had been badly borne by the stomach; it excited nausea and was disagreeable to the taste. He then began the use of the wines, but, finding that they differed so much in their effects, he gave them up until he suggested to Thurber & Co. to try to make a wine of coca free from tannin and extractive matters, and they had, he believed, entirely succeeded in doing so. There were two grains of the hydrochloride of cocaine to the pint of wine. With this preparation he had experimented extensively, not only upon others, but upon himself. He had used it in spinal irritation with excellent results—results which could not be attributed alone to the wine, but in part to the cocaine. He had used it also as a general tonic and for fatigue. For some time past he had been in the habit of taking a wineglassful at the close of his day's duties, and with benefit. It certainly had a de-

cidedly restorative effect without being followed by a feeling of depression. He had also used it in some cases of dyspepsia with a very irritable state of the stomach. He supposed its action was by lessening the sensibility of the stomach, as it lessened sensibility when applied to other parts. It was remarkable to what an extent the irritability of the stomach was overcome by doses of two or three teaspoonfuls of the wine of coca repeated at intervals of fifteen or twenty minutes, until half a dozen doses had been taken. If the first doses were vomited, the succeeding ones would be retained longer, until finally they were retained altogether. Cases of irritability of the stomach due apparently to spinal irritation had been relieved within a few hours by this treatment. Generally when he wished in any case to produce a powerful therapeutical effect, he employed the salt. He then spoke briefly of the physiological effects of coca, and said that the first writer who had described its effects upon the native Indians of South America had given an exaggerated account of its baneful influence, and his ideas had been copied over and over again without the authority being given, until our minds had become thoroughly indoctrinated by them. That author had said, among other things, that coca rendered the teeth black, produced ulceration of the tongue, caused the breath to be foetid, the jaws to become ulcerated, and the bones to soften, and rendered the patient an idiot. But subsequent observers had said that such results must be entirely exceptional, as they had never seen them. If there was discoloration of the teeth, the speaker thought it might be accounted for by the lime which the Indians mixed with the leaves, or by the presence of tannin. There had recently been some very striking stories in the newspapers regarding the injurious effects of the drug upon persons who had become addicted to its use. In order to determine whether or not there was any truth in these statements, he made some experiments upon himself. He first injected hypodermically a grain of the hydrochloride of cocaine, which caused an exhilaration of spirits and a happier state of mind than he had enjoyed during that day. He was unable to sleep that night until four or five o'clock in the morning, and when he got up he had a severe headache. He also had a large evacuation of urine. The effect of the drug was to produce an exhilaration such as would be produced by two or three glasses of champagne. The next night he injected two grains, which produced the same pleasant feeling, and in addition he felt an inordinate desire to write. He wrote eight or ten pages of foolscap, and thought it was the best that he had ever written, but the next morning he found that it was the most extreme nonsense. Each sentence was complete in itself, but no two sentences had any relation to each other. The first part was more incoherent than the

latter. The next night he injected three grains, and although he again felt the disposition to write, he did not indulge it, but he talked a great deal, and made speeches. He knew what he was about, and was able to restrain himself, but it was pleasant to speak. He went to sleep late, and again woke with a severe headache. It was a peculiar fact in his case that at the point of injection there always developed redness and swelling, stopping short only of an abscess. He now had several hard spots on his arms, and waited four or five days, when he injected six grains of hydrochloride of cocaine, three grains at two different places. He then felt decidedly "upset," yet he did not lose consciousness nor his relation to things. He gave instructions to the servants correctly. But he did not feel a strong disposition to write or to talk. He was unable to sleep at all that night. The injections were always followed by a large evacuation of urine, and by headache next day, but without debility. Three nights later he injected eight grains, with about the same effects. The next night he injected eighteen grains, making six different punctures, all within the space of twenty minutes. He became intensely exhilarated, and was unable some hours afterward to recall what he had done. He was in his office, but in some way got to bed, and the next day he found things in more or less disorder in his office. His headache remained for two days, and there was over-action of the heart, palpitation; he could hear it beating on raising his arm to his head. Exaggerated action of the heart had also attended the smaller doses. But he experienced none of the horrible effects which were said to attend the use of the drug in large or continued doses; no disposition to murder or to acts of violence. He acquired no habit; he was able to quit its use at once. Regarding the cocaine habit, he would say that he had given the drug in doses of from one to five grains for three months to a lady suffering from exophthalmic goitre, and she was then able to discontinue its use without any difficulty. At no time did she manifest any loss of moral principle. She took two doses a day. From a theoretical standpoint, perhaps cocaine should not be administered in this disease, but it proved beneficial in this case, for the heart's action, which had been increased, diminished, and became steadier, and the patient felt much better. He had also given it for some months to a lady addicted to the opium habit, carrying the dose up to five grains injected once a day. It overcame the opium habit, and the patient failed to acquire the so-called cocaine habit. In her, and in other patients to whom he had administered cocaine, it produced, as in his own case, extraordinary action of the heart, increased temperature and blood-pressure, perspiration, and indisposition to sleep.

He had used lint soaked in a ten per-cent solution of cocaine, ap-

plied to the vulva, for the relief of masturbation; but it had failed in one case—that of a girl four or five years of age. It had been ineffectual in boys, applied to the glans penis. In three cases of melancholia in women who refused to speak, injections of hydrochloride of cocaine had overcome the prolonged silence. The first was a marked case of melancholia, with stupor, and the patient had not spoken for nine months. At the first sitting he injected one grain of hydrochloride of cocaine. The patient then nodded or shook her head in reply to questions, but would not speak. At the next sitting three grains of the drug were injected, and within four minutes the patient replied to questions by yes and no, and within ten minutes she began to talk, and kept on talking, although incoherently. She did not sleep that night, and seemed to have pain in the head the next morning. The next injection of three grains caused the patient to talk, but less incoherently. This was a year ago, and the patient continued as melancholic as before; but she talked, if that was any advantage. He had failed occasionally to induce patients to speak by injections of cocaine.

As to the cocaine habit, he regarded it as similar to the tea or coffee habit, and unlike the opium habit. He did not believe there was a single instance of a well-pronounced cocaine habit, the patient being unable to stop it at any time if he chose to do so. If a person were to continue its use for a long time, he should be inclined to look for trouble with the heart rather than with other organs.

Dr. J. B. Mattison, of Brooklyn, could not agree with Dr. Hammond that there was not a cocaine habit. Within a few months he had had seven cases of the cocaine habit under his care—five in physicians, two in druggists. He certainly believed there was such a thing as cocaine addiction. He regarded the drug as most dangerous and destructive of the tissues. In certain cases its action was more unfavorable even than that of morphine. The cases reported in the newspapers he thought were founded on facts. In one instance he had written to a physician asking whether the report was true that a certain doctor had been arrested in the street while under the influence of cocaine. The physician had replied that it was true; that the doctor was a victim to cocaine. He could cite other similar cases. In one instance a physician attempted to write a prescription for a patient, but, instead, wrote for the sheriff to come and take him to jail. The effects of cocaine, so far as he had observed, were similar to those described by Dr. Hammond, but, besides the action upon the heart, the great volubility, and the unrest, he had noticed hallucinations and delusions but no homicidal or suicidal tendency. In some cases there was marked emaciation. He thought the effects of the continued use of cocaine were

more decided than those of the continued use of morphine. The patients whom he had treated had acquired the cocaine habit gradually, making comparatively small injections several times a day. Dr. Hammond seemed to think that no dose was toxic; but the speaker regarded Dr. Hammond's case as exceptional, and he would not advise any physician to repeat the experiment.

Dr. J. Leonard Corning thought there was a morbid fear of cocaine spreading throughout the community, and he thought the remarks of Dr. Hammond were timely, as they would tend to allay the prejudice against a most useful remedy.

Dr. L. C. Gray remarked that between Dr. Hammond on one side and Dr. Mattison on the other there was considerable distance, and he did not know how the question could be solved except by further experience. Dr. Hammond's statement that no cases had been reported by medical men was a mistake. Cases had been reported in Europe, but they were not numerous.

Dr. M. R. Richard said that about six years ago he had a case of despondency in a lady disappointed in love. This was in New Orleans, and a physician there told him that he was in the habit of using an infusion of coca-leaves in such cases. He gave it to this woman with happy results. Three years ago he came to New York and was unable to find any coca-leaves. Taken in this manner, the patient would not be likely to get a sufficient amount of the drug to acquire a habit.

The President read a communication from Dr. C. H. Hughes, of St. Louis, in which he said: "Most of the cases of cocaine habit seen by me have been mixed cases of opium, cocaine, and alcohol or ether inebriety, combined or alternating; though I think I know of cases where cocaine is the chief, if not the exclusive, reliance. But these patients are not reliable in their statements. I have not seen a physician addicted to cocaine who stuck to cocaine exclusively. The finale has generally been cocaine and opium and whisky and ether and all the other neurotic stimulants. Opium is a much more agreeable stimulant, and most patients evidently try to get back to the fatal bliss of opium. I have never relied on cocaine alone in breaking up the opium habit. I never use cocaine to intoxication, and never regularly. My rule with cocaine cases, as I usually see them, is to get them back to plain opium, and then break them of that if advisable." Dr. Hughes also referred to the fact that in some cases cocaine produced poisonous effects.

The President referred to thirteen cases of cocaine habit reported by Erlenmeyer, and to a case reported by Bornemann. The subject, he said, had recently been discussed at the meeting of the Congress of German Physicians and Naturalists, when Dr. Smidt reported some

cases of cocaine-morphine habit. The general opinion was that pure cocaine addiction was rare, but that the cocaine-morphine habit was not, and was a very destructive and pernicious habit.

Dr. Hammond did not deny the existence of a cocaine habit; he only maintained that it was unlike the opium habit, for the patient could break it off at will. He was aware that patients addicted to the use of opium sometimes added that of cocaine, greatly to their detriment. As to cocaine being a poison, twenty and even thirty-two grains had been taken without serious results. He differed with Dr. Mattison, who thought it was more injurious employed hypodermically; but the patient came under its influence more slowly when it was taken into the stomach.

FRANK W. RING, A.M., M.D.

Cocaine and Its Fascinations, from a Personal Experience

One year after Dr. Hammond's speech at that noteworthy meeting of the New York Neurological Society, another New York physician, Frank Ring, was so impressed by the extent of disagreement between medical authorities on the subject of cocaine that he wrote the following account of his own cocaine experiences, which was published in the Medical Record, *September 3, 1887.*

"TO some persons nothing is more fascinating than indulgence in cocaine. It relieves the sense of exhaustion, dispels mental depression, and produces a delicious sense of exhilaration and well-being. The after-effects are at first slight, almost imperceptible, but continual indulgence finally creates a craving which must be satisfied; the individual then becomes nervous, tremulous, sleepless, without appetite, and he is at last reduced to a condition of pitiable neurasthenia."—Editorial in the *Medical Record,* November 28, 1885.

"Once a man flies to cocaine for relief from 'cares that annoy,' he generally continues with such rapid strides toward such complete subjugation to its bewitching thraldom as but few will ever be rescued from by any power of will which they may be able to bring to their aid."—Dr. A. B. Shaw, St. Louis.

"It is not only an antidote to opium poisoning—or, more properly speaking, the organic demand for such drug effects as have been acquired by use—but is itself a fascinating and dangerous intoxicant,

the effects of which may be more difficult to counteract and renounce than are those of opium or its derivatives."—Dr. Orpheus Everts, Cincinnati.

"It is a remedy to be used with extreme caution and prudence internally, and the large doses reported as having been given are not ordinarily safe. It will bear watching. It crazes and kills quicker than opium. The possibilities for immediate harm are not only great, but the likelihood of remote damage when tolerance is established is not small. The cocaine habit, more pernicious than the morphine neurosis is the certain entailment of its frequent administration, and its thraldom is far more tyrannical than the slavery of opium."—Dr. Charles H. Hughes, St. Louis.

"I think it for many—notably the large and enlarging number of opium and alcohol *habitués*—the most fascinating and seductive, dangerous and destructive drug extant; and while admitting its great value in various disordered conditions, earnestly warn all against its careless giving in these cases, and especially insist on the great danger of self-injecting, a course almost certain to entail added ill. And the need of caution against free and frequent using obtains in other cases, for there may come a demand for continued taking that will not be denied."—Dr. J. B. Mattison, Brooklyn.

"I regard the cocaine habit as similar to the tea or coffee habit, and unlike the opium habit. I do not believe there is a single instance of well-pronounced cocaine habit, the patient being unable to stop it at any time if he chose to do so."—Dr. W. A. Hammond, New York Neurological Society, November 2, 1886 (*Medical Record* Report). . . .

The remarks made by Dr. W. A. Hammond at a meeting of the New York Neurological Society, and a paper published by Dr. J. B. Mattison, "Cocaine Dosage and Cocaine Addiction," subsequently, caused considerable controversy and argument as to whether cocaine was a harmless or a dangerous drug—harmless in large doses, harmless from constant addiction; dangerous in large doses, dangerous from constant addiction—some maintaining that a great and useful drug was being maligned, others giving due credit to its usefulness, and insisting that it should be used with extreme caution.

There are certainly enough well-authenticated cases to satisfy any unbiased mind as to its danger in large doses. It has killed. It has produced alarming symptoms in numerous instances. The question as to its ability to create a *cocaine habit,* pernicious *per se,* is open to discussion.

I propose to narrate, in as plain and concise a manner as possible, a

ten months' constant use of the hydrochlorate of cocaine, taken entirely from an atomizer, and always through the nasal passages.

I have suffered for the past four winters with a chronic follicular pharyngitis, having an hypertrophy of the turbinated bones. Constant closure at night of the nasal passages; I would awaken several times with a dry, parched throat and mouth. Having used the cocaine spray on several patients with marked temporary relief for the same affliction, it occurred to me that an application of it would be beneficial to myself.

About September 1, 1886, I began to use every night, previous to retiring, a spray of a four per cent solution of cocaine, forcing it into my nostrils by means of a small ball atomizer. For a month each night, I used about a drachm (two grains).

After the first few applications the relief experienced was well marked. I would go immediately to sleep, and breathe quietly all night long. It was a soporific; a dilator of the nasal passages; in fact, a vehicle to "nature's sweet restorer."

At the end of about four weeks' use I experienced a change gradually coming on. My constant evening spray began to lose one of its principal virtues. Instead of going to sleep immediately, a sense of wakefulness possessed me, and it would be half an hour or more before slumber and rest came on. However, as it had not lost the virtue for which I began its use, I did not mind an hour's fanciful and visionary wakefulness.

During the months of November and December nothing of note occurred. Thinking a less quantity would suffice for the purpose for which I used it, I reduced the dose to about one and a half grains. The period of wakefulness increased, but my sleep was quiet and undisturbed during the night. In January I began to rather enjoy its effects, and to take a spray in the early evening, increasing it to two and three applications, until a member of the family suggested that I would better be careful and not resort to the drug too often. Up to this time I had deceived no one in regard to my use of it. I had informed all my friends, especially of the medical profession, how much relief I got from cocaine, and how often I took it, and how long I had taken it.

It did not occur to me up to within four weeks of its discontinuance that I was becoming dangerously attached to the drug, and in February I stopped it entirely for ten days, just to convince my family that there was absolutely no danger of my becoming a cocaine *habitué*. But I found my breathing was less agreeable and I renewed the employment of it. Through the months of March and April I experienced no ill-effects, unless one may consider two or three hours'

inability to sleep as deleterious; but I began to notice a diminution of appetite, which did not disturb me, as that had often happened during the past few years.

On May 1st an incident occurred which saddened my existence to a great extent. I became very much depressed, despondent, and filled with grief. Everything was done mechanically, with lack of interest. Here is where the charms of the cocaine give relief. Temporary relief, but relief. I used it every night four or five times before retiring, each time following by one or two cigarettes. My nights were passed in a dreamy restlessness, my mind set at ease, and spirits exhilarated. The appetite still decreased, the nerves became unsteady, and I was advised to stop cigarette smoking, which I did entirely for three weeks. About this time I very unwisely began to indulge in an occasional spray at the office during the daytime, something which had never occurred before, and June 27th the climax began. During the fortnight following I had one or two patients "go wrong," suffered from anxiety, worry, and overwork, made four or five visits a day for a week to a person afflicted with a purulent ophthalmia, and after each visit I would turn on forty or fifty pounds pressure, and reduce the liquid in the tube half an inch. Then seeking an easy-chair, with a cigarette in my mouth, I would dwell on the trials and tribulations of this life with a calmness and complacency hardly imaginable. My mind was at rest in less than five minutes, a sensation of exquisite *numbness* would steal over my body, creeping up from the feet to the head, everything looked bright and happy, my grief and anxiety were gone, my troubles were ended. After about a week of this state of things I became somewhat alarmed. My friends could not account for my listlessness, loss of interest in themselves and their pursuits. I assured them it was the result of a little too much cocaine; and after making a feeble effort at facetiousness, would relapse into a condition of silence again.

I did my work mechanically and well; my mind was as level as ever half an hour after these inspirations. At the end of fifteen minutes I would have an inordinate desire to go to the bath-room, and upon rising would find myself staggering a little. I had no desire to talk, but thought I might write a few articles to the medical journals, and I did write, and afterward found that my productions were creditable to a man of ordinary talent. During these *séances* I noted a slight increase in temperature, acceleration of the heart's action, no nausea, no perspiration, mind seemingly clear and active. The numbness only lasted two or three minutes. Thirty minutes after a spray of a solution containing four grains I would be entirely myself again, with the exception of a slight headache, which soon passed away upon

using a little bromo-caffeine. I had no appetite during this fortnight of partial bliss, did not sleep well, and lost five pounds of flesh. Probably, during this time I averaged ten grains a day. This is certainly not excessive and would not have caused as much disturbance had I not been under its influence for so long a time. I am sure the second week was more fascinating than the first, and yet I took less cocaine, plainly showing that its effects were cumulative.

July 9th I came to the conclusion that the medicine was getting to be a necessity, that it might become a source of injury to my well-being, and I calmly decided to stop it, which I did. The inclination for it often seizes me, but I crush it with a perfect confidence that I shall never again indulge in its enchantments.

I have computed, from my account with the druggists and recollections of the amount taken, that the cocaine consumed during the ten months will aggregate more than six hundred grains. After the first few months I found a two per cent solution answered my purpose just as well, and reduced the spray accordingly. Another conclusion arrived at from my experience, not heretofore mentioned, is the fact that cocaine must be ranked among the anaphrodisiacs.

I would not like to have my narration considered as a *confession,* nor as the relation of a series of experimental observations. I used the drug simply as a remedy. Whether it became a pernicious habit I leave others to judge. I would not be willing to take the responsibility of a like continuance with any patient; neither would I put it in the hands of one to be used at his discretion. Several times have I been asked, after spraying the nose, what that medicine was which produced such a marked relief in breathing. The answer is always: a solution of the erythroxylon plant. The words coca and cocaine are not in my vocabulary when addressing patients.

Dr. W. A. Hammond took thirty-eight grains hypodermatically within ten days, the last being a solution of eighteen grains. He got to bed, but how he got there he did not know. His office was in more or less disorder. His head ached for two days, his heart-beats were greatly increased. He experienced no disposition to murder, or to do violent acts. And yet he could not recall what he did during the time that he was under the influence of the drug. Dr. Hammond incurred the danger of six, eight, and eighteen grain-doses for the purpose of ascertaining if there was any truth in the statements in the newspapers regarding the injurious effects of cocaine addiction. He did not acquire the habit. I should have been very much surprised if he had. It is remarkable that he did not acquire a disgust for it. I have saturated my system with crude opium for four or five days, until the formication, loss of sleep, and constipation nearly drove me frantic,

and yet I acquired no opium habit. Pernicious habits are not acquired in ten days. Time does the business. Neither are they formed in men of strong and determined wills—men like Dr. Hammond, who have not the time to devote to such fanciful and illusory moments. But, take a man who is ill, down-hearted, unable to work, and subject him to my experience, and what would become of him? Would he not be in imminent danger of becoming a cocaine *habitué?*

At the time I began the use of cocaine I was occasionally treated by Dr. W. A. Dayton, Assistant Surgeon to the Manhattan Eye and Ear Hospital. It may be interesting to laryngologists to know the condition of the parts before and after the treatment. Dr. Dayton has kindly handed me the following:

"September, 1886—The septum naris, unevenly hollowed on the left, with a corresponding bulging on the right side, was eroded at several points from acrid secretion. The mucous membrane of the left turbinated bone was hypertrophic, while that of the right nostril maintained a close approximation to the septum. The posterior extremity of both bodies were enlarged.

"The vault of the pharynx was the seat of considerable thickening, sufficient to partially occlude the mouths of the Eustachian tubes, as manifested by a decrease in the hearing power and the advent of tinnitus aurium. The back wall of the pharynx showed the usual extension of inflammation from the parts above.

"July 28, 1887—Rhinoscopic examination at this time shows: (1) That the breathing space in both nostrils is greatly increased; (2) that the mucous lining of both nostrils is in a comparatively healthy condition, and that the secretion is diminished; (3) that the face of the pharynx from the vault to the base of the tongue is still thickened and swollen, and (4) that the atresia naris formerly existing is certain to recur unless the applications of cocaine are continued or other suitable means be presently adopted to forestall the event."

LEON NATANSON, M.D.

Concerning Nasal Lesions Among Cocaine Sniffers

The article from which the following is taken first appeared in Revue de Laryngologie, Otologie, Rhinologie *57, February, 1936. It is translated by George Andrews.*

One of the main dangers associated with the immoderate sniffing of cocaine is that it can burn a hole right through the nose. Dr. Natanson describes in meticulous detail the different stages of the process by which this takes place.

AMONG sniffers of cocaine ulcers frequently develop on the septum of the nasal cartilage, which bring about its perforation without the person realizing what is happening. If the ulceration is still superficial, it can heal into scar tissue if the use of cocaine is stopped.

The perforation is invariably found on the cartilaginous part of the septum. . . . The shape of the perforation is round at first, but becomes oval as it gets bigger. The edges are smooth. . . . In the large ones that reach the bone, the neighboring parts of the skeleton are thickened and often have a whitish streak. In the perforation, nonfetid scabs are frequently seen.

Enlarged perforations can be accompanied by a collapse of the nasal cartilage.

It is exceptional for cocaine sniffers not to have lesions on their septums. . . . In my opinion, the perforation is caused by the intense vasoconstrictor effect of the cocaine. Constant use brings about a spastic anemia of the cartilaginous part of the septum. Circulation is impeded. There is progressive atrophy and molecular destruction of tissue, lead-

ing to its resorbtion. First an ulcer develops, then later the perforation. . . .

Bonvicini writes: "Prolonged use of cocaine gives the nose a diffused augmentation of volume and a dull bluish paleness, as if made of gelatin or putty. At the tip of the nose there is frequently a rounded dividing line, and the wings of the nose are slightly swollen. The slang expression used by sniffers to describe the shape of such a nose compares it to the shape of the buttocks. Sniffers recognize each other easily in this way, and cocaine dealers spot prospective clients. The wings of the nose, which are slightly turned up, are constantly in movement. The nostrils are dilated and surrounded by a pink border about one millimeter wide, which gives the impression of a constantly blocked nose, 'astonished nose,' 'plugged nose.' "

On the hair of the nostrils, the nasopalatine recess, the zone of Kisselbach, and, more rarely, on the lateral linings and inferior cornet, one often sees lumps of cocaine crystals and dirty gray-green crusts, sometimes actively bleeding. From such crusts, with the help of the usual reagents . . . one can confirm the presence of cocaine on corpses that have been dead for weeks. . . .

One also observes partial or total disappearance of the sensitivity of the mucous membrane and abolition of the contact reflex. This anesthesia is especially marked two or three hours after the last sniff, then disappears little by little. However, it can last for days or even weeks. It is ordinarily most intense on the septum and inferior cornets. . . .

Kohchi, of the Oto-rhino-laryngologic Clinic of the Kyoto Academy of Medicine, published an important work in Japanese entitled "Experimental Research on Nasal Lesions Caused by Cocaine" (*Annals of the Academy,* 1932). The work is sixty-two pages long . . . accompanied by a detailed summary in German. . . . The author carried out his investigations on rabbits, which he injected in the nose with varying doses of cocaine, usually solutions at 20 per 100 and 50 per 100, and as paste once or several times a day. He experimented with sixty-seven animals for eight months. Here is a brief summary of the results.

Repeated injections invariably brought about alterations whose importance varied according to the concentration and frequency of dosage. With the 20 per 100 and 50 per 100 solutions once or twice a day a severe catarrh developed, which soon became chronic rhinitis. The epithelium underwent a mucous disintegration with necrosis, then metaplasia or desquamation. The conjunctive tissue developed in an exaggerated fashion and the glands atrophied. The malphigian epithelium became horny and desquamated.

When cocaine was introduced in the form of paste several times a

day, the epithelium underwent a necrosis of coagulation. After a substantial period of time ulcers appeared on the mucous membrane of the septum and the anterior part of the inferior cornets. The ulceration penetrated more and more deeply, finally bringing about perforation of the septum and collapse of the anterior part of the cornet. The surface of the ulcer was covered with leucocytes and lymphocytes, fibrine, and red globules. Around its edge an inflamed zone was to be seen with infiltration and minor hemorrhages. After a long time the borders of the perforation became scar tissue covered with flat epithelium. Then there were almost no more inflammatory phenomena.

When the injections continued, the perforation grew larger and larger, but stopped growth at a certain stage. It was always situated at one centimeter behind the anterior nasal meatus. It always had a round or oval form and was from 0.3 cm. to 0.5 cm. in diameter.

The perforation caused by the cocaine paste took place in the following sequence: first of all, necrosis of the epithelium, then a "clean tunic," then a perichondria, and finally the cartilage. On the side where the injections were made, there was ulceration, necrosis, and sometimes a loss of substance from the anterior part of the cornet. But here again, what finally resulted was scar tissue. The alterations produced by the cocaine paste brought about the necrosis and destruction of bone tissue.

CARLOS GUTIÉRREZ-NORIEGA

Mental Alterations Produced by Coca

Gutiérrez-Noriega's many studies on coca and cocaine use have always been based on the presumption that coca is a deleterious Indian vice that reinforces and worsens their endemic social problems: poverty, economic exploitation, disease, malnutrition, and ignorance. Referring to his earlier studies, he stated in the 1947 essay summarized below: "With regard to coca's effect on mental activity, we should remember, first, that several years ago we published our preliminary observations on this theme using as subjects inmates of the Central Jail in Lima who were habituated to coca."

The following is a verbatim translation by David Solomon of Gutiérrez-Noriega's résumé of his paper "Mental Alterations Produced by Coca," which was published in Revista de Neuro-Psiquiatría *in Lima in 1947, one year after the appearance of Cabieses Molina's essay "The Anti-fatigue Action of Cocaine and Habituation to Coca in Peru," a summary and translation of which follows the Noriega résumé.*

PSYCHOLOGICAL studies were carried out in the province of Huancayo (Peru) on rural dwellers who are habituated to coca. The results demonstrate the existence of acute and chronic mental alterations.

1. Acute mental alterations occur while coca is being chewed, as a result of the stimulating action of the drug, and last only while it is present in the system. These alterations are characterized by great variations depending upon the amount of coca used and according to the personality of the subject.

2. The most frequent alteration, which is observed in 100 per cent

of the cases, is the suppression of vital sensations. In effect, the chewing of coca suppresses or diminishes sensations of hunger, thirst, sleepiness, and weariness.

3. The most frequent alteration of thought while coca is being chewed is the introverted, subjective (autistic) satisfaction of desires. This is found in the majority of cases.

4. Of the affective alterations (changes in mood and feeling) that occur while coca is chewed, the most frequent is a sense of extreme well-being (euphoria).

5. Only in a small number of cases were alterations of perceptions observed. The most common are the following: modifications in visual sharpness, impairment of color vision, multiple vision, vision in which objects seem either smaller or larger, and impairment of the ability to visualize large objects. In far more rare instances, illusions, fantastic visions, auditory hallucinations, and auditory and visual synesthesia (sensory confusion wherein sights are heard and sounds are seen) occur. Alterations of basic body awareness (the general sense of life deriving from the totality of organic sensations), alterations of spatial awareness, and alterations of the sense of time are also quite rare, but they do occur in some cases.

6. In only one case were disturbances in ego awareness observed.

7. Chronic mental alterations only appear among inveterate coca chewers. It is not clear that these alterations are caused by the toxic effect of coca, since other factors could be responsible. The author is inclined, nevertheless, to consider coca to be the principal cause of alterations that affect personality, thinking, intelligence, and memory.

8. Among other personality characteristics, there is a noticeable predominance of *tipo esquizotímico anestésico,* the unevenly balanced, schizoid personality type, showing loss of affect (feeling) stemming from withdrawn emotional states that are not in keeping with ideational content or the rational mind. Moreover, the alterations observed in the inveterate coca chewer are diametrically opposed to those seen in chronic alcoholism. Whereas inveterate coca chewers are predominantly asthenic and autistic (weak and apathetically withdrawn), in alcoholism the most prevalent state of mind is characterized by heightened feeling and is hypomaniacal (mildly crazed, excited, and either convivial or belligerent, or both successively).

9. Certain observations are made with respect to the memory, intelligence, and thought capacity of the inveterate coca chewers, but the author reserves conclusions concerning the type and magnitude of these disturbances for another study.

10. The importance and consequences of coca chewing among children of school age and factory workers is discussed.

FERNANDO CABIESES MOLINA

The Anti-fatigue Action of Cocaine and Habituation to Coca in Peru

In 1946, Fernando Cabieses Molina, an eminent Peruvian pharmacologist, marshaled considerable evidence that sharply contradicted official attitudes, which, then as now, viewed coca chewing as a vice. In this essay, published in 1946, he chastised those South American research workers (often funded by authoritarian regimes) who tended to serve up results that flattered and reflected anti-coca prejudices held by reigning oligarchies. Such investigators as Carlos Gutiérrez-Noriega, he pointed out, too frequently paid scant attention to perhaps the most crucial factor in the Indian custom of chewing the coca leaf: the oral route of administration ensures that the leaf's potent principles are slowly and harmlessly absorbed by the digestive system. Thus, in the process of producing their energizing effects, coca's alkaloids are rapidly metabolized and excreted, never reaching dangerous levels of concentration in the bloodstream and body tissues. Cabieses Molina also indicted as scientifically unsound psychological studies (such as those conducted by Gutiérrez-Noriega) based on the observation of delinquents, prisoners, and the mentally ill—subjects who frequently used pure cocaine rather than the far milder coca leaf; he noted that more representative models were to be found among the socially functioning industrious Indians of the Andes, who habitually chew coca.

The following summary of the essay was translated by David Solomon.

Anti-fatigue Action of Cocaine and Habituation to Coca in Peru

SINCE coca chewing affects the lives of more than 15,000,000 Indians who live in the Andes, investigators and politicians should be attentive to the fact that the biological sciences must question the validity of any studies and political decisions not based on laboratory-proved data and accurate scientific observation of all the pharmacological, physiological, geographical, and social variables involved.

Not long ago, Gutiérrez-Noriega claimed: "The stimulating effect of cocaine on the productivity of physical work and on resistance to fatigue can never be thought of as an argument favoring the free use of coca." This quotation is typical of a basic stance that merits discussion in a broader context.

Many attacks on the coca habit in Peru have failed to take into account the concentration factor. Concentration is not dosage; the concentration of a drug at the tissue level, where it becomes effective, depends not only on the amount of the drug ingested, but also on the route of its administration and the body's ability to absorb, destroy, and eliminate it.

It has been shown that the minimal daily dose of cocaine, as it appears in the coca leaf chewed by the *coquero,* ranges from 42 to 91 milligrams. These amounts are considerably below the toxicity threshold of cocaine, even if it is injected directly into the bloodstream. As early as 1880, experiments demonstrated that 50 milligrams of cocaine administered orally to a rabbit produce such reactions as considerable excitement and dilation of the pupils, but if the same amount is injected beneath the skin, the animal rapidly dies. Although scientific experimenters should hardly need to be reminded of these basic pharmacological facts, many scientific as well as literary articles on coca have ignored them.

In 1902, it was suggested—and, in 1919, it was shown—that the far milder effect of cocaine taken by mouth was the result of its destruction in the liver, through which it must filter before passing into the bloodstream. In 1940, Goodman and Gilman asserted that cocaine, if taken orally, is effectively broken down in the gastrointestinal tract, and is then detoxified by the liver. It has been estimated that the normal liver is able to destroy what would otherwise represent a lethal dose of cocaine every sixty minutes.[6] It has also been observed that cocaine habituation is rapidly attained when it is injected intravenously, whereas habituation develops more slowly by subcutaneous administration, and very slowly, with scarcely visible symptoms, when it is taken orally.

An equally significant factor is the form of the drug when it is used. Even when taken orally, the effects of chemically pure cocaine, swallowed in a gelatin capsule in a 1 per cent aqueous solution, cannot be

accurately compared to an ingestion of the plant's juices mixed with ashes, with or without the alkaloid liberated, since the concentration factor is unknown.

The speed with which cocaine is absorbed is a vital consideration. It is frequently forgotten that *coqueros* subdivide their coca leaves into small doses that they chew and suck on throughout the day. In 1944, it was shown that even grossly lethal doses of cocaine do not induce severe toxic symptoms if administered in subdivided fractions over a period of six or seven hours. It is therefore essential to quantify precisely the amount of cocaine reaching the tissues and bloodstream when coca is chewed. The quantity and speed of absorption and incorporation into the bloodstream cannot be calculated by mere speculation and deduction. So long as absorption factors are unknown, it is scientifically perilous to refer to the toxicity of a dose of cocaine as ingested by a *coquero* in the Andes. In 1933, it was reported that the concentration of cocaine in the brain tissue becomes equal to the concentration found in the blood, which explains the drug's stimulating effects on the nervous system. The ultimate elimination is by destruction in the liver, for even if the kidneys excrete a large percentage, it was demonstrated in 1933 that the drug is re-absorbed by the mucosa of the bladder. At that time it was also proved that the chemical properties of the blood destroy the drug, which at a pH of 7.4 to 7.5 at 38° C. is quite labile. The important role played by the pH factor of the blood in the elimination of cocaine increases when it is considered that the injections of alkaline solutions diminish cocaine's toxicity, while acid solutions increase it. In 1934, moreover, it was shown that animals fed acidifying diets were more susceptible to the toxicity of cocaine.

As for cocaine's habituating effects, it has been often demonstrated that it is simple to create a craving for the drug in dogs and monkeys. However, no withdrawal symptoms are produced when the administration of the drug is stopped. When the drug is injected, animals show pleasure and demonstrate their hunger for it in all possible ways. But when it is withdrawn, there are no observable disturbances in their physiology. There is more of a psychological rather than a physiological dependence. The absence of withdrawal symptoms thus sets cocaine apart from certain other substances that *do* physically addict animals. Moreover, acute psychological habituation to cocaine is observed in animals only when the drug is injected directly into the bloodstream. When it is given orally, the habituation occurs very slowly, with scarcely any symptoms.

These facts, when applied to the use of coca, explain why the major-

ity of Indians can give up coca with relative ease when they move to lower altitudes along the coast, where its use is also legal.

The view that coca is necessary for life at high altitudes should be scientifically considered. Gutíerrez-Noriega, however, without discussing it, has found it erroneous, claiming that "it completely lacks a scientific basis." But it is quite possible that cocaine exerts a significant effect upon the interchange of body gases, and that it nullifies fatigue by adjusting metabolic disorders in which anoxia (insufficient oxygen) can represent a significant factor. This possibility has been stressed in the past by such figures as Unanue (1794), Von Tschudi (1847), Markham (1862), Christison (1876), Merzbacher (1929), and Mutch (1932). Their scientific value surely cannot be negated merely because they were written long ago or are based on observation rather than experimentation.

As Merzbacher wisely remarked, "Coca use at high altitudes cannot be considered as casual and unimportant." Accordingly, the responses of *coqueros* held as prisoners in coastal jails (Gutiérrez-Noriega and others) must be evaluated differently from those of mountain laborers who may chew coca because of the demands of a harsh, oxygen-thin environment. It is wrong to persist, as Gutiérrez-Noriega has, in explaining the effects of coca on the Andeans' psychology from the observation of delinquents, criminals, and the mentally ill. Pending definitive evidence, views that Indians living at high altitudes are degenerate and vice-ridden, with ensuing repressive legislation, will lack any scientific validity.

From an impartial point of view, it is difficult to demonstrate the difference between the habituations of *coqueros* and heavy smokers of tobacco, who are treated by society with tolerance, indulgence, even humor. Moreover, at least coca may possess some redeeming qualities, whereas there is no pharmacological argument favoring the use of tobacco.

The presumed disadvantages of coca have been largely speculative. It has even been asserted that the ruling Incas took note of its poisonous properties and outlawed it to safeguard their subjects' health. But it is now scientifically known that toxic effects can only be produced experimentally on animals when pure cocaine is injected, in high doses, directly into the bloodstream or beneath the skin. And, while historians agree that during some periods of Incan history it was forbidden to commoners, the nobility never deprived itself of the privilege of chewing it. An Incan law that sanctified a toxic shrub and allowed poisoning and degeneracy only to the reigning hierarchy would surely have proved suicidal to the ruling class.

The short-lived outlawing of coca by the Spanish colonizers, who cruelly enslaved the Indians, has also been cited as progressive legislation, since it reflected a humanitarian interest in protecting the health of the Indians!

Nevertheless, coca chewing has proved to be a most durable residual characteristic of Incan culture. Mutch has stated: "It is clear that coca use must exert an irresistible appeal, more long-lasting than the fascinations of political power, civilization, language or religion. . . . The Incan religion, with all its involved rituals, has died, their alphabet is unknown to archeologists and their literature has been lost; notwithstanding, their living descendants are still devoted to coca, and their devotion will continue while their race survives." The Spaniards well understood, and feared, this tenacity. Their spiritual conquest of the Incans led them to attempt to stifle the last vestiges of their faith, which held that the coca plant was a sacred and vital element in many rituals. Pharmacological knowledge did not induce the Spanish religious chroniclers to label coca "the weed of the devil." It is more likely that religious zeal led them to try to root out customs they took to be pagan. Referring to coca as a "gift of the devil," they attempted to convince their compatriots and the Indians that the drug was harmful. Among the Indians such propaganda utterly failed, but it appears to have met with success among some contemporary scientists and legislators. Literary authors, as well, tend to serve up historical facts as pharmacological truths, without subjecting them to impartial scientific analysis.

Cocaine's pharmacology has caused and still causes a reaction against coca; but it is perilous and most artificial to confuse the pure chemical alkaloid, injected in large doses, with the orally ingested coca leaf. Although both possibly have similar effects, coca is far less potent than cocaine, and certainly far less dangerous than some people suppose. For cocaine to cause genetic degeneracy, with decreases in birth rate, growth, and weight and an augmented death rate, it must be injected into rats in doses that are relativly much higher than those chewed by Andean *coqueros.*

Considering coca's indubitably superior qualities as a stimulant, the possibility of a rare example of actual addiction in a *coquero* does not justify condemning coca as a "curse," the expression used so often in the literature. Without adequate scientific evidence, it is rather simple to blame coca and the Indians who use it for the poverty and backwardness found in the Peruvian Andes. But such an attitude only serves as an expression of the desire to avoid coming to grips with the reality of our social errors.

OTTO NIESCHULZ

Cocaism and Cocainism

Dr. Nieschulz carried out his research in the laboratories of the chemical firm Promonta GmbH, Hamburg, Germany, and published the results in 1969 in Munchener medizinische Wochenschrift. *His findings, translated by Michael MacGregor, raise a number of important questions that have not yet received an answer, such as the mystery of cuskohygrine's role in the action of coca.*

THE chewing of coca leaves is at present mainly, but not exclusively, confined to the highlands of Peru and Bolivia, as well as some neighboring areas of Chile and Argentina. The yearly consumption is still considerable, and is estimated by Goodman and Gilman (1965) at 90,000 kg. in Peru alone.

For many of the Indians living in the highlands, coca is an indispensable comforter. It banishes hunger and tiredness, makes greater work loads possible with little to eat, and performs many functions in the social life. Coca leaves can be part of the wages for agricultural work or a bonus or (together with tobacco and maize beer) thanks for help. They are among presents brought by guests and expenditure involved in festivities. They give protection in situations that are felt to be dangerous, and their oracle may be asked before making decisions. The leaves are also used for the purposes of healing, mostly as a tea or a poultice. In circles of the population still imbued with old traditions, they are among the normal necessities of life, like salt. Great economic interests are bound up with the plantations.

Coca leaves are mostly chewed three, occasionally four, times a day, before, during, and after work, which is interrupted for this purpose. The chewing, or, rather, kneading, of the coca ball lasts for about half an hour. After this it is usually kept in the mouth for another hour or

two. The amount of cocaine taken in per day by this method is about 350 mg., according to a U.N. estimate in 1950. Women do not ordinarily use coca. . . . Coca powder is apparently sniffed occasionally.

On the History of Coca Taking

Indian traditions and legends point to a very long history of coca taking. Excavations have confirmed this, and similar typical utensils have been used by the coca chewers for over 1,000 years.

In 1846, Von Tschudi described coca chewing as we know it today, and so did Amerigo Vespucci in a report in 1504 (translation in Brooks, 1937), shortly after the discovery of the New World. From the civilization of Moche (A.D. 200–800), with its high artistic achievements, a vase painting depicts richly dressed coca chewers at a rite, and from the same period a series of clay figures show the coca chewer: bag around the neck, lime container, and long lime rod; occasionally also a protruding cheek, owing to a coca ball (Schmidt, 1929, Kutscher, 1950, Disselholf, 1966). Coca leaves have been found even from the period of the early planters (2500–1200 B.C.) before the introduction of pottery. From one stratum, whose age exceeds 3,000 years according to carbon-14 dating, a calabash used for storing coca lime (Engel, 1957) has been unearthed.

Coca leaves and the bags and purses intended for holding them, as well as lime containers and narrow spoons or spatulas for extracting the lime, were often placed with the dead. The quality of the artifacts proves how highly esteemed coca was even in the higher classes of the native society.

Coca leaves were found in daintily woven little baskets; in purses of woven materials, sometimes inlaid with a multicolored mosaic of feathers; or in small hide purses decorated with richly ornamented tassels. Valuable figured gold bags for coca leaves come from the Moche period (A.D. 200–700). Also among the grave finds are lime boxes, which are likewise in various forms; some very precious containers, created for ceremonial purposes, come from the coastal Tiahuanaco Period (A.D. 800–1100). Miniature spoons or spatulas for extracting the lime are represented by relatively numerous exhibits made of bronze, silver, or gold, with fine, small figures in human or animal form on the handles. They mostly come from the Ica Period (1100–1450), and they attest to the height of Peruvian miniature art at that time (Bressler, 1906, Schmidt, 1929, Ubbelohde-Doering, 1952, Mujica Gallo, 1959, Disselhoff, 1966). . . .

Archeologists report how every morning before beginning excavation, their workers would bury coca leaves and tobacco and pour some of their drinks over the spot as a sacrifice for the spirits of the hill being excavated, or else, acting under compulsion of the old belief, they would ask a magician to come to the excavation sites. He would treat the selected coca leaves like dice, determining what lay ahead, and afterward prepare the sacrifices for the goddess of the earth (Ryden, 1957, Disselhoff, 1960).

The Spaniards destroyed the caste system of the Incas and prevented the emergence of new Indian ruling classes. And they did not adopt coca chewing. These circumstances may have contributed to the fact that coca, which had advanced as far as the Isthmus of Panama and the coasts of the Caribbean (Ernst, 1890) at the time of the Incas, turned out to be less widespread after this, and continually decreased in its distribution. Only in parts of the country firmly rooted in tradition does coca consumption continue fairly strongly; old habits change slowly. A further decrease could be effected by extending the education system and, above all, by improvements in economic circumstances. The abolition of large estates after the Bolivian agricultural reform (1953) had at first considerably decreased the production of coca leaves in the Yungas, near La Paz, owing to the neglect of the plantations. Since then, however, the former peak has been reached, because the need has not decreased. Despite the government's forbidding the planting of new coca fields, the agricultural workers who had become independent extended their areas of cultivation to keep pace with demand (Léons, 1967).

There have probably always been a few Europeans who have secretly chewed coca leaves, even in the upper classes in the towns. Poeppig, Von Tschudi, and others report this from the last century and, as I was reliably informed, it is still so today.

Uses and Harmful Effects of Coca

Opinions have differed widely, even in the past. . . . It was held responsible for the miserable circumstances of large sections of the Indian population, and we find this view even in modern books on the history of the inhabitants of the Andes. Intensive ethnographic and sociological studies report on the low standard of living and insufficient nutrition in the high valleys, also the varied use of coca leaves; but adverse effects are not mentioned (among others, Stein, 1961, Vellard, 1963). Moreover, in many areas the ready supply of coca

leaves does not lead to a regular use of the drug; it can be restricted completely to a few special occasions. . . .

Clinical observations had meanwhile shown that even in chronic coca use, no states of excitement occur and likewise, apart from a few exceptions of excessive use, no signs of any danger of addiction. The consumption of coca leaves could be distinguished as *cocaism,* as opposed to *cocainism* in Europe and North America, where only pure cocaine is used. A United Nations Organization commission confirmed this view. According to its observations, the chewing of coca leaves possesses all the characteristics of a habit that only occasionally develops into an addiction and can easily be given up as circumstances change and taken up again without difficulty upon returning to the old environment. Generally harmful effects are considered possible because of the cocaine content of the leaves. There are no signs of a connection between coca and criminality, in contrast to alcoholism. The very low standard of living and the use of coca leaves have a logical connection. When there is insufficient nutrition, coca makes greater work loads possible temporarily by suppressing the feeling of hunger; moreover, it makes the hard life seem more bearable. Coca is not the reason for poverty but, rather, the result of it, and we can reckon on a reduction of coca use, given the appropriate improvements (U.N. Representative Commission Enquiry on the Coca Leaf, 1950).

The Effect and Significance of Coca

Summary: physical performance is temporarily increased, and signs of fatigue delayed. An impoverished life under harsh environmental conditions seems easier to bear. Dissociation from everyday environmental influences may have been the prerequisite for the religious experience of Indian priests at their rites, as Trimborn and Kelm conjecture. This would at the same time explain the manifold use of coca leaves in religious ceremonies and as a sacrificial offering, likewise the striving to limit free use to the ruling class in the Incan Empire.

It is striking that coca was for centuries considered merely a remarkable ethnographic peculiarity in spite of its effects, which were known even in Europe from the accounts of numerous travelers (Hartwich, 1911). The isolation of cocaine and its medical application did little to alter this. Even after the recognition of the distinction between cocaism and cocainism, only a few efforts have been made to discover a satisfactory explanation for the different effect of cocaine as a pure substance and as the main constituent of coca leaves.

The Destiny of Cocaine in the Body of the Coca Chewer

Even a few years ago the view was held that by means of the usual addition of alkali the liberation of the cocaine base from its combination with plant acids is facilitated, and that in the stomach the soluble and thus reabsorbable hydrochloride is formed. In opposition to this, a Peruvian work group held the opinion that cocaine was to a considerable extent broken down into benzoyl ecgonine and ecgonine in the body before its reabsorption (Montesinos, in 1965, gave a résumé of its results). The breaking down is said to begin in the mouth by means of the saliva and the added alkaline substances, but mainly happens in the gastrointestinal tract and in the wall of the intestine under the influence of various digestive juices.

A regular addition of lime to a plant drug, a practice likewise arising from the people's experience, can be found in the Indo-Malayan region in connection with betel. As with coca, so with betel: a thorough mixture of lime with the liquid exuded in chewing releases the alkaloids contained.

In tests to explain the way betel works we had observed a quantitative degradation of arecolin to arecaidin when lime was added to arecolin solutions and to extracts of the drug (Nieschulz and Schmerzahl, 1967, 1968).

Active Compounds of Coca

Under similar test conditions the possible influence of lime on the metabolism of cocaine was investigated. From a watery solution of cocaine hydrochloride, only 15 per cent of the cocaine was degraded to ecgonine; the remainder was deposited as a base that was insoluble in water. By aqueous extraction most of the alkaloids can soon be made into a solution from finely powdered leaves. Judging from the thin-layer chromatographic analysis of the extract, the extractable amount of alkaloid is not influenced by adding lime as Hartwich (1911) had already ascertained. The spot of cocaine in the chromatogram had not yet measurably altered after allowing five minutes for the lime to take effect; after thirty minutes it was considerably smaller; and after an hour it had practically disappeared. Saliva as the liquid of extraction did not alter the alkaloid composition.

In the leaves of Peruvian origin examined by us, cuskohygrine was present as the second main alkaloid, next to cocaine; three other alkaloids were present in small amounts. It is not one of the ester alkaloids separable by alkali, and thus the cuskohygrine spot remained unaltered in the chromatograms even allowing a long time for the lime to react (Nieschulz and Schmerzahl, 1969).

According to those findings, cocaine, ecgonine, or cuskohygrine, alone or together, could cause the psychic effects of coca use, its influence on physical performance, and its antidepressive effects. According to our tests and Montesino's data, we have to reckon with a considerable decomposition of cocaine and the formation of correspondingly large amounts of ecgonine. Therefore we first considered whether ecgonine, about which there are only a few general pharmacological data, possesses psychotropic properties, which make a share in the effects of coca seem possible. We did not have at our disposal large enough amounts of cuskohygrine, whose mode of effect is likewise unknown.

Experiments on Animals

While the stimulating effects of parenteral doses of cocaine could be reproduced in animal experiments, too, no striking changes in behavior were to be expected from the ecgonine. Just as with the arecaidin, we tried to trace the presence of psychotropic properties by using animals that had been damaged in their activity. For the testing of physical performance of small laboratory animals there are still no completely satisfactory methods.

Mice were used for the tests. Influences were measured on spontaneous activity in small cages, motility by photocell-beam interruption, and on exploration drive via questing movements on the cage walls. As a model for the influencing of a required activity the learning of a simple escape reaction was chosen: within a certain time the animals had to slip into a little box that was let down before them in order to avoid high-pressure air buffeting. For this animals were also taken whose activity was impaired by chlorpromazine or by mechanical destruction of parts of the cortex, sometimes also the regions below it (methodological data in Nieschulz, 1967, 1969). For investigations of physical performance the reflex of grip (after Frommel and his team, 1957) was used; mice held up by their tails strove, in their anxiety, to hold on to a wire net brought into contact with their paws for as long as possible. When applied subcutaneously, cocaine considerably strengthened the motility of mice, even in medium doses.

Essentially higher oral doses have no influence. The learning of a simple escape reaction was somewhat improved by both forms of application. Retests a day later showed differences, however. Whereas the animals treated orally behaved like the control subjects, the retentive powers in animals treated subcutaneously before learning were seriously impaired, probably as a result of central stimulation processes during the learning phase. Mice that received cocaine intraperitoneally or orally could with their paws hold on to wire nets 1½ times body weight for more than twice as long as the control subjects.

Ecgonine proved to be a very tolerable substance for mice intravenously. Spontaneous activity was not affected. The learning of the escape reaction and retention were slightly improved. Very marked were the differences in the learning achievements in animals whose activity was limited by neuroleptics or by mechanical destruction of parts of the cortex. The saving of time in the necessary training amounted on average to 40 per cent or 35 per cent. The ability to cling to weighted wire nets was increased by ecgonine to the same extent as by cocaine.

The absence of stimulating properties in cocaine after oral doses supports the view that a high percentage of the cocaine dose is destroyed in the gastrointestinal tract in animals, too. The phytochemical observations presented here and, after treatment with ecgonine, the increased readiness to carry out the required activities, especially when the level of activity is reduced, the results of tests that may be termed an increase of physical performance—all these fit the pattern of coca and make participation of ecgonine in its effects seem quite possible.

Experiments on animals can only point to possible effects. Therefore the question remains open as to whether the effect of coca is only due to small amounts of cocaine, which is not destroyed, or due to its combined effect with ecgonine, or whether the latter is the crucial substance. Still requiring explanation is whether cuskohygrine is of any significance. A final explanation of the actual processes taking place during coca chewing is of significance in view of the health, social, and economic problems connected with it. On the other hand, it would also be rewarding to trace the pharmacological basis of such valuable properties as the overcoming of fatigue symptoms, hunger, or thirst, or the transmission of a feeling of consolation under difficult living conditions in order to evaluate the knowledge gained for the development of new psychoactive compounds. When the local anesthetic properties of cocaine were first discovered, they were the points of departure of exemplary new developments in synthetic substances.

The experiments were carried out in the phytochemical and pharmacological department of the chemical firm Promonta GmbH, Hamburg. Extensive accounts of pharmacological findings appear elsewhere.

I am indebted to Dr. A. Ortiz of San Marcos University in Lima for valuable information concerning the present situation in the use of coca leaves in Peru.

JERRY HOPKINS

Cocaine Consciousness: The Gourmet Trip

An earlier version of this article appeared in Rolling Stone *in 1971. Jerry Hopkins is also the author of* Elvis, *a biography of Elvis Presley.*

NOT since Sherlock Holmes was taking it to improve his mental acuity back around 1900 and the original recipe for Coca-Cola actually contained some extract of coca leaf had cocaine been so avidly accepted by a large public. Not since LSD swept through the popular marketplace a decade earlier had an illegal drug been so massively exploited. And *never* before had a "hard drug" (an epithet usually reserved for opium derivatives) been so widely bought and sold, in successful song and cinema (affecting wardrobe, slang, etc., just as LSD had done) as well as on the street.

In the early 1970's, along with bisexuality, platform heels and *Deep Throat,* cocaine snorting became chic, was in some subcultures *de rigeur,* crossing all generation gaps and reaching into Bel Air mansions, Harlem tenements, Berkeley crash pads and split-level rancheros in Middle America with equal facility and dispatch.

There is a story told by Gary Stromberg, who was the Rolling Stones' personal publicist when they toured the U.S. in 1972 and still goes on the road regularly with bands, thus is exposed to a large slice of the popular marketplace. "Do you know how many coke spoons I see and do you know who's wearing them around their necks?" he asks. "Fourteen-year-olds! In Cleveland, man. In Cleveland and Houston and Minneapolis."

Gary says he was startled at first, because as anyone "into it" knows,

most people who use it don't wear paraphernalia where every cop in town can see it. More important, in 1974 cocaine was selling for between $1,000 and $2,000 an ounce, $50 to $80 for a "spoon" (or gram) —the latter being about enough to get two people high for about half an hour.

"Those kids couldn't have known from cocaine," the publicist says. "But they bought the image, they bought the symbol, they bought the coke spoon, and hung it on a chain with a roach clip, a cross, a Star of David."

A registered pharmacist chuckles when he hears this story. He buys cocaine from the Mallinkrodt Chemical Works in St. Louis, or possibly from the Merck Chemical Company in West Germany, for $22.40 an ounce. And it's pure, while what is sold illegally on the street has been "stepped on," or cut, an unknown number of times with such variant substances as Vitamin B_{12} (popular in 1974), methamphetamine (generally agreed to be a bummer) and (the old standby, used for its innocuous taste) a baby laxative called Minite.

Worse, much of the coke being sold is not even cocaine at all, but a mix of procaine and methedrine—procaine being one of several chemical combinations that are more anesthetic than stimulant: thus, the blend with speed. And when it *is* coke, because the drug passes through so many hands on the way to the consumer, the actual cocaine may be reduced to only 6 to 30 per cent of the snort.

Why would anyone pay up to 10,000 per cent mark-up on a product he knows has been brutally adulterated? In the glittery, shattered early '70's, cocaine offered more than chemical euphoria—it also offered a higher station in life. In a word, Status. In a drug-oriented society, coke had become the gourmet trip.

Ted is one of the top dealers in New York. He is twenty-four and black. "Consider the accessories," he says. "Now you can buy a little brass coke spoon tucked inside a 30-caliber bullet for $2.95, add a dollar for a neck chain, but if you're really into coke, man, you're into fine accessories. You don't put something that expensive in brass. You carry it around in a silver vial—maybe it's even monogrammed. And you snort from a silver spoon. That's my marketplace. I don't sell to the musicians any more. It was far-out being on that scene in a way, but only a few of the musicians have any re-finement, if you know what I mean. My man has to have class. Now I sell on Park Avenue."

Still, gourmet drug or not, much of the traffic of the early '70's has been in the low-income or no-income "hip" community. At first it may seem puzzling. Then it becomes clear that many of the coke-heads are dealing, as in the marijuana market, just enough to keep themselves in coke.

"Look," says a small-time pusher, "I can buy a fairly clean ounce for 1,500 bucks, step on it once and double my money, or sell half after I cut it, get my money back and still have half an ounce for myself."

He pulls a small glass vial of white powder from the pocket of his faded, embroidered, patchwork jeans, carefully sprinkles two thin rows of the powder on a pocket mirror, tightly rolls a new $20 bill, places one end next to one row, the other end in his right nostril. He presses his left nostril closed and inhales through his right, vacuuming the powder in a swift movement along the row. *Sniffffff.* He breathes deeply, then repeats the procedure with the other row and the other nostril. *Sniffffff.*

(Coke can also be dropped, rubbed on the gums, or shoved as a suppository, although these techniques are rarely used, and shot, which is popular largely amongst ghetto blacks and "needle freaks," and usually thought to be outside the circle of status-heads. Even sprinkling it on an open cut will get the user high. Coke is that readily absorbed.)

Almost immediately the pusher's heartbeat accelerates, his body temperature rises slightly, his pupils dilate, his face flushes a little, his nose numbs. In minutes he will become garrulous, restless, excited. He will feel confident, larger than life.

"Dynamite!" he says, holding the vial aloft. "Wanna little taste? The first snort's on me."

Of course the pusher would like his snorting partner to buy a gram or two. But that does not mean the offer of a free nose-full was necessarily made merely in the interest of salesmanship. The coke may have been offered for other reasons entirely. "Some people," says one Los Angeles user, "don't even do it to get high. It's social now. It's like: 'I've got so much money I can afford to give you some.' "

Naturally cocaine is not the only drug to have found a gourmet status-seeking audience. In the 1840's, some of Paris's most respectable physicians and artists and writers (including Théophile Gautier and Charles Baudelaire) were ritualistically sharing a drug recently brought back as spoils from Algiers; they called themselves members of "The Hashish Club." More recently, when an entire marijuana subculture developed, a status-conscious pecking order was given the lowly weed according to geographic origins: *i.e.,* Panama Red, Acapulco Gold and Michoacan in North America, and in Europe the imports from Africa, Durban Poison, Swazi Gold and Malawi Laughing Grass; to the dealers and smokers who had them went a sort of elitist respect.

Nor has cocaine gone unappreciated. By 1880—eighteen years after its first distillation from the coca plant—it was being widely prescribed in the U.S. for alcoholism and four years after that the young Viennese

physician Sigmund Freud was recommending it for everything from morphine addiction to digestive disorders and melancholia.

By the turn of the century the image was changing and the audience was broadening. That was when Sherlock Holmes became popular literature's first coke-head . . . when coca cigarettes, cocaine cordials, "tonics" and other patent medicines, including popular "catarrh cures," were available . . . when one American firm even promised in its ads that the wonder drug would "supply the place of food, make the coward brave, the silent eloquent. . . ."

All this came to an end with the Pure Food and Drug Act of 1906 and the Harrison Narcotic Act of 1914, which made the gift, sale, and possession of cocaine subject to the same dire federal penalties as those regarding morphine and heroin. Most states also mistakenly identified cocaine as a narcotic and similar laws were passed everywhere. That was when coke went underground.

It wasn't too long before the drug made its first come-back, however. That was in the 1920's and 1930's, when cocaine was popularized simultaneously by singers in the rigidly limited rhythm and blues (or "race") and country and western markets, and the faraway chic of the Broadway set.

There were, for example, several songs called "Cocaine Blues." One had as its key line, "I'm simply wild about my good cocaine," but also contained a warning: "Coke's good for horses/Not for women or men/The doctor said it'd kill you/But he didn't say when."

Another song with the same title told the story of a man who shoots his woman down (while high on coke) and closed with a more direct admonition: "Lay off that liquor and let that cocaine be."

Then, in 1930, the Memphis Jug Band recorded "Cocaine Habit Blues." The first two lines told the tale: "Cocaine habit's mighty bad/It's the worst ol' habit that I ever had."

Not all songwriters agreed. In 1927, Victoria Spivey's "Dope Head Blues" openly praised the drug for its superman qualities: "Just give me one more sniffle/Another sniffle of that dope/I'll catch a cow like a cowboy/Throw a bull without a rope."

While Champion Jack Dupree, one of the great New Orleans blues pianists, recorded two versions of "Junker's Blues," in the first saying his sister used coke, in the second saying, "Some people say I use the needle/And some say I sniff cocaine/But that's the best ol' feeling/In the world that I've ever seen."

Meantime, in the glamorous world of the Great White Way, Cole Porter, who was known to try anything at least once, wrote in his appropriately titled Broadway show *Anything Goes* (staged in 1934):

"I get no kick from cocaine/I'm sure that if/I took even one sniff/It would bore me terrif-ically too/But I get a kick out of you."

Lillian Hellman in her 1974 best seller *Pentimento* told a story about a lunch she had with her friend Tallulah Bankhead in 1939: "Tallulah, Herman [Shumlin, the producer] and I were having dinner in the old Artists and Writers Club, a hangout for newspapermen. Tallulah took two small bottles from her pocketbook, put them on the table, and seemed to forget about them. As we were about to go back to rehearsal, she picked up one bottle and tipped it to put drops in her eyes. She rose from the table, repacked the bottles, led the way to the door, and let out a shriek that brought the restaurant to its feet.

"Herman rushed to her, she pushed him aside, other people pushed toward her, she turned for the door, changed her mind, and whispered to nobody, 'I have put the wrong drops in my eyes.'

"Herman ran to a phone booth, she shouted after him, he called out that he was getting a doctor, she said he was to mind his own business, and suddenly, in the shouting and running, she grabbed my arm, pulled me into the toilet and said, 'Get Herman off that phone. I put the cocaine in my eyes and I don't tell that to doctors or to anybody else. Tell him to shut up about it or I won't go back to the theatre."

Tallulah's appreciation notwithstanding, cocaine use was waning in the late 1930's and although it remained a special and occasional treat among some segments of society—notably jazz musicians who sometimes mixed it with heroin to increase the "bang" or "rush" (this was called a "speedball"), and doctors, to whom the drug was most available—by the 1950's the drug was essentially forgotten, or pushed into a position of general disrespect. This was the period when Raymond Chandler, in 1942 in his novel *High Window,* talked sneeringly of "coke peddlers," while another writer said of Sherlock Holmes: "People get put in jail by a coke fiend. How could you trust this bum?" It was also during this time that the phrase "coke-head" became a synonym for any dull or slow-reacting person, and the drug was given so many of its colorful nicknames, usually associated with the criminal world: Bernice, big bloke, bouncing powder, C, Charlie, C.K., Corrine, cubes, flake, girl (an antonym for heroin, or "boy"), gold dust, happy dust, her, the leaf, sea snow, star dust, white drugs and white stuff.*

There is a responsible body of research and belief that supports the theory that the black market for coke dried up and was replaced by

* From *The Underground Dictionary,* Eugene E. Landy, Simon & Schuster, 1971.

a cluster of synthetic drugs, the amphetamines. It is further believed that cocaine made its big comeback in the 1960's when the narcotics agencies began coming down on the amphetamine black market.

This is only part of the story, for it was in the 1960's that the concept of "drug gourmet" was developed and adopted by such large numbers. This was when it wasn't enough that you dropped acid, it was also important what *kind* of acid it was; did Owsley make it? was it called "sunshine" or "window pane"? or was it imported from the Sandoz labs in Switzerland? Marijuana was being rated simultaneously and as that happened the top price of grass went through the roof; whereas in 1968, southern Californians could buy a kilo (which usually was under the 2.2 pounds that it was supposed to be) for $125, a few years later the same short kilo was selling for $300 to $1,400. With the higher priced stuff nearly always going to those few in the youth subculture who could afford it, the rock stars.

In the 1960's, and now in the 1970's, the rock stars set the social pace, succeeding the fading heroes and heroines of cinema as the prime shapers of popular society. (There were obvious exceptions, such as Peter Fonda and Dennis Hopper, about whom more in a minute.) As it happened, one of the things the singers, songwriters and musicians were into was drugs, and some of these were into coke. So they sang about it. This was when Fred Neil, Hoyt Axton, and Dave Van Ronk, all folksingers, contributed to a song best identified by the line "Cocaine . . . running around my heart and my brain." From Neil's version: "I said, 'Come here, mama/come here quick/Cocaine makin' your poor boy so sick/Ah, bitter sweet."

At the same approximate time in New York, a column from the underground *East Village Other* called "Kokaine Karma" became a radio show at a college station in East Orange, New Jersey, then made the move to the bigger audience of New York's hip, listener-sponsored station, WBAI-FM. And not long after that, Wavy Gravy was talking to the *Realist:* "I like to think of it as the thinking man's Dristan." And *Esquire* put a gold coke spoon on the cover of an issue that paid noble and reverent homage to "soul."

In California, much of the hip white establishment was aboard the cocaine train by 1969, when coke made its first important, contemporary film appearance, as record producer Phil Spector made a buy from actors Dennis Hopper and Peter Fonda in *Easy Rider.* At the time, many of the viewers thought the drug Phil was snorting was heroin; never in the film was the drug identified. But neither was the act of snorting *any drug* ever challenged; *no moral judgments were made.* The attitude seemed to be that which Spector himself took the following December when he used a photograph from the film as his

Christmas card. There was Phil, one finger held firm against one nostril, snorting a white powder from a tiny spoon through his other nostril. With the message: "A Little Snow at Christmas Time Never Hurt Anyone!"

(Actually, nearly a year ahead of *Easy Rider* came *The Night of the Following Day,* a kidnap thriller starring Marlon Brando, Richard Boone, and Rita Moreno, the latter of whom seemed to spend most of the film snorting coke through a tightly rolled $100 bill. The film was not successful and can be said to have contributed little if anything to "cocaine consciousness.")

By late 1969 the rock and roll rush was on, as dozens of the top stars were known to be using coke regularly. In San Francisco, many of these stars also were including coke references in their new songs. Paul Kantner of Jefferson Airplane, for example, released his first solo album, in it a song called "Hijack," which opened with a simile: "The summer was dry like your nose when you've been behind coke for a day and a season." A year later Paul was back with Grace Slick in another album, *Sunfighter,* which came with a booklet carrying the message, "Those of you who are serious about this whole thing, oozing along like a Cadillac, need some good solid hospital wacco in the nose." While the Grateful Dead (in the summer of 1970) released an album that included a song they played at most concerts, "Casey Jones": "Drivin' that train/ High on cocaine/ Casey Jones, you better watch your speed." The following year (1971) the Dead returned with a best-selling single, singing about "living on reds, Vitamin C and cocaine" in another concert favorite, "Truckin'."

In Los Angeles, meantime, another rock band, Steppenwolf, had a minor hit the same summer (1971) with a song written by Hoyt Axton, "Snowblind Friend": "He said he wanted Heaven/ But prayin' was too slow/ So he bought a one-way ticket/ On an airline made of snow." Suddenly the word "Cocaine!" made an emphatic appearance between the third and fourth verses of John Lennon's "Hold On John." And then came a blues with a Cole Porter-ish lyric from Taj Mahal: "Champagne don't drive me crazy/ Cocaine don't make me lazy/ Ain't nobody's business what I do."

The big push came in the late summer of 1972. This was when a Los Angeles band called the Eagles went onto the singles charts with a song called "Witchy Woman." Part of the lyric was coke-inspired—"Crazy laughter in another room/ And she drove herself to madness with a silver spoon"—and the record went to No. 9, remaining on the charts for thirteen weeks.

This was also when a film called *Superfly* was released, which, accompanied by a superb soundtrack album and two hit singles from

Curtis Mayfield, further saturated a large segment of the popular marketplace. Cocaine consciousness was peaking.

The opening scene set the style and philosophy of the film, as Priest, a big-time Manhattan coke dealer, won a street fight against impossible odds and escaped to his rat-infested Harlem tenement building, where he traveled the garbage-choked hallways and then unlocked his apartment. Zap! It looked like a Playboy Pad designed by Wilt Chamberlain. It was thus quickly established that Priest was a hero, a man of physical daring and prowess who, in the great American tradition of Horatio Alger, overcame the vast and oppressive forces of his environment to become an enviable success. That he was a criminal—and black!—was not important because Priest wanted to get out of the business and even if he wanted to make one last big score ($1,000,000 split two ways), the bottom line read "pusher-gone-good," and that alone gave him heroic stature, made him acceptable to an otherwise closed Christian community. That he was a hedonist who wore flashy clothing, drove expensive cars, and had a white woman as well as a black, satisfied other American traditions (and fantasies), and that "the man" he eventually met in the film, from whom he was going to buy thirty kilos for $300,000, turned out to be a deputy commissioner of police, made him a counterculture hero, too. For some of the same reasons, Priest (played by Ron O'Neal) remained a black hero, as well, and was not co-opted by a predominantly white audience (as was, say, Jimi Hendrix), satisfying instead a number of black dreams (the life style, the shoulder-length straightened hair, the Caucasian nose) while personifying the epitome of black *machismo,* becoming what the reviewer in *Rolling Stone* called "Supernigger." *Superfly* appealed to nearly everyone.

(Of course, the story had a happy ending. Anticipating a double-cross, Priest switched briefcases with his girlfriend—the black one—and drove away to freedom and retirement . . . thereby satisfying the cinematic tradition of riding off into the setting sun.)

Black *machismo* was all the rage in the next two years as *Superfly* became the progenitor and archetype of a new genre: the black exploitation film, which by 1974 seemed destined to outnumber the beach party and motorcycle exploitation flicks of American-International a decade earlier. So many were there that Walter Burrell, movie reviewer for the black Los Angeles *Star,* when asked couldn't remember the titles of more than two. What he did remember was that "just about every so-called black movie I've seen has a coke scene in it." Another reviewer, *Daily Variety*'s Arthur Murphy, agreed, saying, "Coke scenes are as *de rigeur* as explicit fuck scenes, so numerous these days they are sleep-inducing."

As in the case of most song lyrics, most of the black drug films carried an antidrug message. In Universal Studios' *Willie Dynamite* coke was snorted in a scene that portrayed the users unflatteringly. In *Gordon's War,* from Twentieth Century-Fox, a returning Vietnam vet's "old lady" overdosed and he and some friends set out to clean all the coke and heroin from the neighborhood. Even in *Superfly* it was clear how hollow a life Priest led as a dealer and criminal; it was, after all, a life style he wanted to end. The film also showed the process that kept coke illegal yet available in quantity in the ghetto.* It didn't matter. The audience accepted the medium, not the message—perhaps believing that something that was *that* illegal (twenty years for possession in some states) and *that* expensive couldn't be all that bad.

The success of the music of *Superfly* paralleled the success of the film most precisely. Just as the weekly grosses pushed the movie into the late summer and autumn Big Boxoffice lists, so did record sales account for an impressive record-buying audience. The title theme, "Freddie's Dead," first appeared on the singles charts in mid-August and remained there for sixteen weeks, going as high as No. 4. A follow-up single, "Superfly," entered the same charts in November, stayed for fifteen weeks and went to No. 8. While the soundtrack album was a best seller for nearly a year and went to No. 1: "I'm your mother/I'm your father/I'm that nigger in the alley/I'm the doctor when you need/Want some coke? Have some weed/You know me/I'm your friend/Your main boy/You contend/I'm your pusherman. . . ."

By 1973 there was a degree of market satiation that was astonishing. Whirling almost dervishly in its continuing quest for new life styles to exploit, the hungry media settled briefly on that of the black pimp and suddenly there were dozens of magazine articles and books and television reports—most of them featuring cocaine and its use and sale quite prominently. In head shops, bookstores, and boutiques in all major cities and most smaller ones there was a rash of cocaine posters. One had the word "cocaine" emblazoned across a large red circle in Coca-Cola script. (This reverse rip-off also appeared on T shirts.) Another was a reproduction of one of the soft drink's vintage serving trays, showing the Coca-Cola girl lifting a spoon to her nose. (Coca-Cola, ever diligent in the protection of registered trademarks—and fragile sensitivities—sued to halt distribution, and won.) Cocaine paraphernalia in stores—spoons, vials, dispensers, and snort-

* Not all the films dramatically using cocaine have been American. Spanish director Luis Buñuel won a Cannes prize in 1973 for *The Discreet Charm of the Bourgeoisie,* and *Turkish Delight,* from Holland, was nominated for an Academy Award.

ers—began crowding some of the more traditional marijuana roach clips and hash pipes.

As the popularity of the drug increased, the product proliferated, and, as the product proliferated, the popularity of the drug increased.

There was also by now a rapidly developing cocaine "mythology," the storytelling that made certain dealers, smugglers, events, and rituals "legend in their time." There was a dealer from Minnesota, for example, who successfully crossed customs in Los Angeles (coming from Peru) with two kilos of coke taped to his legs and torso by placing a note inside his passport that read: "I'm a federal narcotics officer and am traveling without identification. I'm following the brunette with the big purse. Please expedite my crossing and hers. There could be violence." Another story told often in the rock circuit had the singer of a No. 1 novelty dance record investing the $40,000 he made from his hit in cocaine, then living for four years off the profit of that.

On a recent tour of the English group, the Who, a dealer called "Mr. Peru" appeared backstage in Atlanta and Montreal, and was replaced by "Mr. Bolivia" in Dallas, Detroit, Boston, and Philadelphia. In New York there were small devices that looked like a large fat silver bullet with a rodlike handle—hold the rod and turn the bullet and exactly one snort's worth is expelled from the bullet's nose: a steal at $250. While in another area of ritual, it became known that if the user rubbed cocaine onto the glans penis, numbing it, he could prolong his sexual performance indefinitely—or, at least, until the coke ran out.

Before 1974, rock bands had to stock up before leaving their East Coast or West Coast homes to go on tour, but by then coke was available everywhere. Perhaps a little less so in New York, where new laws made dealing so perilous, but according to publicist Gary Stromberg, "it didn't mean coke wasn't available—it only meant it was somewhat harder to find and considerably more expensive." The rapidly swelling staffs of the U.S. Bureau of Narcotics and Dangerous Drugs in New Orleans, Atlanta, and Miami, major ports of entry for illegal cocaine, add further testimony to increased volume. And whereas police in dozens of cities reported few arrests for possession or sale of the drug a few years earlier, by 1974 the arrests and charges were numerous. It was quite clear that the black market for coke was greater than ever before in the drug's 110-year-old history.

But if popularity was up, abuse seemed to be down. A few years earlier there *was* abuse—as was chronicled (in 1971) by a doctor in Los Angeles who wanted to remain anonymous lest he develop a reputation as someone who treated only Hollywood's coke-heads. At the

time, he said, a significant part of his practice came from the rock community.

"Coke is an easy drug to abuse," he said, "because it is so rapidly metabolized. But it also leaves the body rapidly, so the user, if he can afford it, does some more coke, and when that detoxifies, he does some more. The next thing you know he's in my office complaining of congestion, saying nasal sprays don't help. Sales of these sprays, and drops, have rocketed, by the way, and I directly attribute that increase to the widely extended use of cocaine."

The doctor reached for *The Pharmacological Basics of Therapeutics,* the recognized authority on pharmacology (the science of drugs), and turned to the section on cocaine.

"Listen to this," he said. "Nobody's going to argue with Goodman and Gilman [the authors] and this book was published in 1970, but listen to this and see how fast these things get outdated. This is a quote: 'Cocaine abuse is uncommon in Western countries.' You know what I got to say to that? Bullshit."

He dropped the heavy volume on the desk. "When a musician comes in with nasal congestion, the first thing I ask is how much coke is he sniffing. It's so rampant now. I see coke spoons and roach holders on neck chains every day. Coke spoons, roach holders, and nose drops."

The doctor said there wasn't much he could do for the visiting stars, but he did give them some advice. "These people were experiencing 'chronic poisoning' from their habitual use. Their friends might have noticed a mental deterioration, weight loss, a definite change of character. I told them that prolonged sniffing could cause chronic nasal congestion and—this is the part that got home—perforation of the septum, the nasal wall. Cocaine causes the blood vessels to constrict and with insufficient blood reaching the area, the partition between the nostrils atrophies. I also told them that because the drug attacks the mucous membranes, it also invited infection from bacteria and that although it was not physiologically addictive, there was a high potential for psychological addiction. My advice was to spend their money on something else."

Three years passed and, in 1974, most of the doctor's old patients had long ago stopped seeing him. Nor was he seeing many *new* patients. In fact, many of the original cocaine gourmets had got off the train. They had seen friends burn themselves out, snorting themselves into a state of acute paranoia, which was often accompanied by a loss of critical judgment. One San Francisco musician, who had been importing his cocaine from Merck in West Germany, says he woke up one morning and couldn't breathe, so quit. Others did much the same. Or cut down.

"The price is the other thing," said a thirtyish record-company executive. "Who can afford enough to abuse it? If you don't deal, and you aren't independently wealthy, it's practically impossible to afford a big coke habit. It all depends upon what kind of expense account you have."

Thus, in 1974, cocaine was socially canonized. One could imagine a magazine advertisement with the headline: "What kind of man snorts coke? The man with an expense account. . . ."

Or the man who lived like he had one.

RICHARD WOODLEY

Dealer: Portrait of a Cocaine Merchant

In this excerpt from Dealer, *we listen to "Jimmy," a tough black hustler, describe to journalist Richard Woodley his life as a cocaine salesman in Harlem. This brilliant piece of sociological reportage relies on a faithful rendering of contemporary black idiom, rather than on the dehumanizing jargon of academic phraseology, to bring out the facts and to achieve its authentic effect.*

I SHALL call him Jimmy. He is thirty, and at 5′ 10″ and 190, is built like a pro football cornerback, which is what he had hoped to be. He has a trim mustache and an Afro. When he moves his head, or an arm, or a hand, it is as if his whole body adjusts slightly, ready to move in any direction, at any speed, at whatever force required; physically he is very together.

He reached under his soft sweater-shirt which was worn outside his slim brown custom-made trousers, and from a specially designed pocket he pulled out a small .25-caliber Browning automatic. He snapped out the magazine to expose a full clip of bullets, then snapped it back in and laid the automatic on the table between us. From another hidden pocket he produced a gold cigarette case and flipped it open. There were a row of pills and capsules, four joints of marijuana, and a dollar bill rolled in the shape of a joint. He took out the dollar bill and opened it carefully with just thumbs and forefingers, his powerful hands moving as precisely as a surgeon's. In the crease of the bill lay a narrow mound of bright white powdered cocaine, about a table-

spoonful, he said, worth $150. Then he reached inside his shirt neck and pulled up a gold chain on which dangled a tiny gold spoon with diamonds in the handle. He leaned forward to reach the coke with the spoon, scooped some powder, put the spoon to his nose, and sniffed sharply, instantly emptying the spoon. He snorted two spoonfuls in each nostril—a two-and-two. Then he looked up, sprung his eyes wide open, and smiled slowly in satisfaction.

"That," he said, his words crisp and clear, "is top-shelf coke, superfly. That is why people come to me. They get *the* best. They get it when they want it. And they come back."

He picked up the automatic, extended his arm, and wheeled slowly around to face the window. He sighted along his arm and down the barrel and out the window at Lenox Avenue. Then he brought the gun back down and tucked it into his trousers so that just the tip of the butt showed, until he smoothed his shirt over that. "But they pay. Cause I come back too."

It was a serious bit of theater, an introduction to Jimmy's "flash"—what others might call style—which is crucial on the street where he earns his livelihood. It is a closely studied art, a technique of survival. Flash is in the clothes, the cars, the eyes, the walk, the talk.

"You got to have the flash," Jimmy said. "I guess it's like acting. But cats recognize the flash on the street. They get to know you by the flash. They suspect you're somebody. Like, a lot of cats on the street sort of know who I am. They know but they don't know. They know a little. 'Who's that?' a dude will say. 'That's Jimmy,' the cats will tell him. 'Oh yeah?' the dude will say."

Jimmy is a full-time hustler, whose specialty is cocaine, which he deals on a scale that may bring him $5,000 in a good week. He has a partner named Slick, whose specialty is heroin. He has a strongarm named B.J., whose specialty is karate and who collects on difficult accounts.

Hustling, dealing in illegal goods and services, is a high-risk business for high stakes, where the fast money is in Harlem. There are hundreds of hustles and thousands of hustlers. Any late afternoon, along Lenox Avenue, or Seventh or Eighth, in that area of Harlem extending north from Central Park and concentrating on the corners near 125th Street, Cadillacs begin to assemble. Custom Eldorados worth perhaps $15,000 on the straight market but often nearer $5,000 here, double-park outside the bars and restaurants. There are Eldorados with special sunroofs, all-white tires, rear windows cut in the shape of flames, interior lights of blue and red and yellow that flash on and off like Christmas trees. The flashiest of these autos often belong to the pimps. But others,

two-tones with all the electronic extras such as stereo tape decks, TVs, telephones, belong to hustlers too. Jimmy has one, so does Slick. As the Eldorado is the hustler's gilded coach, so are the men and boys who wipe them off at a curbside for five dollars his footmen. Most of the cars were bought hot; so were the diamonds and gold, the furs on the women, the suits, the guns. The drivers, dressed in custom-made wear that clings and shimmers with color, and broad-brimmed hats worn at rakish angles, or applejacks—dusters—tilted forward over their foreheads covering Afros or slick hairdos, extend hands bedecked with rings and hold doorside conversations. Or they become part of the fluid movement of people in and out of the action bars, where contacts are made, deals consummated, debtors sought. The flow at first appears casual and random. But there is a cool intensity in the stares, and there are subtle and quiet eddies around certain people, by the telephone, in corners. Big-time athletes and smalltime pimps, hustlers, whores, undercover cops, businessmen, and junkies share the bars, but not everybody talks to everybody. Hustlers have a hierarchy. And a stranger freezes the action like a piece of dry ice.

At one bar where Jimmy is known, four people were shot to death in front of the pretty young barmaid over a period of a few weeks ("It's not like the Playboy Club, where all the horny bastards are always trying to pinch ass," a client said. "Everybody up here is getting laid, so nobody bothers the barmaid.") . . .

Outside, police cars are always in view, slowly cruising up and down the avenues. But the two cops within lounge back in their seats and ignore the Cadillacs. Foot patrolmen may stop occasionally and exchange a few words with the attendants, or even suggest that an Eldorado be moved so that somebody else's car which is blocked can get out.

Jimmy pulled aside the curtains and pointed down toward Lenox Avenue, to the heart of the hustler's Harlem. "Look out there," he said in a voice made nasal—as if he suffered a chronic cold—by the daily intake of cocaine which hammers at the mucous membranes so that they sometimes bleed. "Look at those nigger Cadillacs, all those fuckin pimps. Look at those cops. Look at those pimps and hustlers and cops. This city is the fastest city in the world, right? The fastest and the toughest. And they got the best PO-lice force, the best equipped PO-lice, in the world, right? So here I am." He swung his shoulders and snapped his fingers. "The way I look at it, I must be one of the fastest hustlers in the world, right? I gotta figure I'm one of the fastest, cause here I am." He let the curtains fall back and turned to face me, raising his eyebrows. "Right?" . . .

He took out his wallet and came over to me. "I want to show you

something," he said, holding it out between us as he counted bills. There was $1,200 in hundreds and $300 in fifties. He counted it again and smiled.

"This is for the takeoff cop," he said. "You got to have something on you, cause that's the only chance you got. But if they want you, they get you. Sometimes they take your stuff and your money, and then they take you too. If they really want you, they bring their own stuff and put it on you." He touched the butt of his pistol, which was tucked in his pocket. "I ain't gonna shoot no cops unless I have to. The gun is not for the cops. The gun is for the takeoff man in the street. Like you got a lot of cats out there who got nothin to lose. Those are the cats that you have to worry about. And they don't just stop you on the street anymore and take the G or two G's you got in your pocket. They take your address book and go to your apartment and your friends' apartments and clean you all out. And then maybe they hurt you anyway."

He arched his eyebrows and spoke softly, with the hint of a smile. "That's why you got to be fast." . . .

"My partner's thing is dope," Jimmy said when we were alone. "You know, duji, smack, scag, tragic-magic. I don't dig the heroin thing personally. Then you got to deal with crazy junkies. Slick and me started on reefer, and I went to coke and he went to scag. Scag is where the most money is. But me, I laid with the other two. I don't sell scag. I just tell Slick to see so-and-so. I don't take care of it. I don't even want to know about it, man. So I got into coke. My clientele is different. No junkies. Like, a two-and-two, that's worth at least ten dollars. It would cost you maybe forty or fifty dollars to coke up yourself for the evening. So you're dealing with some people got some bread. And they don't get strung out snorting. So if they run out, and they don't have any bread, they don't have no habit coming down on them that sends them after your ass." . . .

When I first met Jimmy in the summer, he had been dealing cocaine for about a year. His goal then was to lay aside $100,000 by Christmas—five months away—buy a nice house, retire from hustling to run some legitimate business, marry his woman, and raise a family. Hustlers don't live long as hustlers. "I *know* it's not a career," he will say. So far he has not been busted, not since his childhood days, and never for drugs. Many hustlers survive, few make it big, but the dream is there for all. It is, in fact, the dark side of the American Dream.

Cocaine, the least-discussed of the so-called "hard drugs," is yet a staple in the diet of entertainers and the favorite of the drug dealers themselves; the most expensive "high" of them all; the King.

In the illegal drug business, cocaine is sold cut in $10 or $20 capsules (a $20 cap is enough for anything from a three-and-three to a six-and-six, depending upon the snort); teaspoons and tablespoons (tablespoons are "quarters"); "pieces," which are four tablespoons, or about an ounce; parts of "keys" (kilograms, 2.2 pounds) from eighths, quarters, halves, all the way to whole keys of pure cocaine, which costs, in New York, anywhere from $14,000 to $20,000.

A dealer is a pusher with status. The pusher is the lowest level of drug peddler, selling the smallest amounts directly to the users on the street. The dealer sells larger "weights" and has some protective layers of personnel between himself and the street.

For reasons of both money and safety, the dealer tries to move up the ladder. Soon, a dealer always hopes, he will be able to generate more business than his own supplier can accommodate, and then the dealer can jump up a step to deal directly with the man his supplier has been buying from. Each step up means there is another shield between the dealer and the street, and the farther from the street—where carelessness, stupidity, violence, and risk are greatest—the more secure the business. As the dealer rises up the ladder, he buys larger amounts, which enables him to handle a purer quality of cocaine, have greater turnover, and deal with fewer and more responsible people.

As with any other business, advancement is largely a function of ambition, wit, and daring. A dealer may deal easy, at a moderate pace to complement income from other—perhaps legitimate—enterprises, or he may deal hard, high-pressure, running at top speed full time to make it quicker. In either category, the cocaine dealer is not a shopkeeper reliant upon random customers drifting in off the street. The dealer must be a discreet and consistent customer for the man above him. Just so with his own clientele, it must be trustworthy. While there is consignment and credit, it is on a short-term basis, and the terms are harshly enforced. It is a business of huge cash flow, and commits the dealer to a delicate balancing act.

Jimmy deals hard, which means that he invests all he has in product, and then must move it quickly to get his money back. Everybody along the line is pressured to move the product quickly, because cash must flow back up the stream in a hurry. Jimmy doesn't always have product on hand, since he himself must have the cash—or most of it—to buy it. When a good customer wants cocaine, Jimmy, now himself a customer, must make a quick connection for purchase, for if he is unable to provide the right quality of coke quickly enough, he risks losing the customer to another dealer. So he doesn't say he can't get it. In the manner of a true salesman, his pitch is always posi-

tive. He'll string you along. He can always get what you want. Sure, get right back to you. Sometimes, rather than admit he can't get it—either because he is short on cash or because his supplier is short on product—he will simply become unavailable, go underground much the same as a threatened debtor, and will surface when he has the product. This, along with a loose-schedule life style and care for security, is why communications with him, as with other dealers up and down the line, are undependable. There are some long nights for dealers and customers alike, while at one end of the line a customer waits hungrily for some snorts of coke, and at the other end the dealer searches anxiously for cash or a supplier with cocaine on hand. Neither cash nor product lies around very long. His skillful manipulation of these elements caused Jimmy to suggest from time to time that I call him the "Juggler."

Dealers keep their records various ways. Jimmy keeps a good bit of his business in his head, some in a pocket notebook, some on scraps of paper tucked into his wallet. First names are listed, and beside each is a dollar figure which is that amount owed to Jimmy. Higher up the line, somebody's book has Jimmy's name listed too, with a dollar figure beside it. "Normal" buying and selling keep him hopping. What jams up the whole system and jeopardizes operations for everybody are delinquent accounts. Debtors, therefore, are punished with sometimes dramatic severity.

"Hey!" Jimmy said. "You know what B.J. can do?" He stepped back against the wall and fanned out his hands, palms down, slowly. "B.J. can stop your heart without even breaking the skin. B.J. can take any part of you and break it in two before you say a word. B.J.—hey, you know what he can do? You're standin there, right? I'm standin here. I'm B.J. Maybe you got a roscoe in your pocket. B.J. can swing his leg all the way up and touch his nose with it. You know what that means? That means his leg can take your head off on the way. And you won't even see it comin. He'll drop a dude so fast, and the dude will hurt so bad he'll wish he had been shot." . . .

The dealer's status is supported in his "stash," which is, aside from the dealer himself, the heart of the operation. Primarily, the stash is where the drugs and processing equipment are cached, where the cut is milled in and the drugs are packaged for sale. Since drugs are not "saved up" like money, the size of the stash indicates not savings or thrift, but the more important flow of drugs through the dealer's business. Additionally, the stash is a hidden storage depot for armament and even cash, since banks are not appropriate repository for

this money. "I know guys with pillowcases full of cash," Jimmy once told me. "So much cash they actually don't know where to put it." So when he has some extra thousands he wants to put aside, the money joins the extra pistols, ammunition, and the drugs themselves at the stash.

As important as building the stash is protecting it, for it is the stash that holds enough evidence to get Jimmy and Slick killed or sent to prison. Ordinarily, nobody but Jimmy, Slick, and perhaps a few associates who help with the milling is permitted near the stash, or even to know its location.

They don't keep their stash at home. "If they bust me at my place," Jimmy explained, "and there's some weight around, that is a heavy bust, and I go to prison. But if they bust me at home now, what do they find? A reefer? A little personal shit? That's nothin. A suspended sentence at the most."

They have their stash in an apartment building outside the city, rather than in a more convenient Harlem location. "Cause the neighborhood's the thing," Jimmy said. "Like, around here or down in Greenwich Village, the cops just have to have *that* much"—showing a pinch—"suspicion, and they'll bust the door down. But I keep my stash in a fly neighborhood, a white, respectable, high-priced neighborhood where the cops don't go bustin down any door just because they feel like it. They don't hassle people out there. A girl lives there, a very respectable girl with a very respectable job. And when I go out there I'm s-o-o straight, dress well, drive a nice car, always polite, just visiting, like I was somebody's very nice boyfriend."

When he buys product, he usually takes it directly to the stash. When he has a sale lined up, he returns to the stash to mill. He visits the stash about three times a week. . . .

Jimmy lit up another joint. "Now you wonder why would somebody sell you more value for the same price? Maybe he's just dumb. But when I'm milling up, I always put in a little extra, just give them a little extra. That keeps the quality up, that keeps business up, that keeps your reputation up. You start shortin people and you lose business or you get shot. People always lookin for better quality. Like the very best superfine coke can take a four. But mostly the good stuff can take a three for the street. Now when I say my stuff can take a three, I mean it can *take* a three. I don't fuck you around. I sell you stuff guaranteed on a three, and you will *like* it on a three."

"How come you don't have a big pile of coke here," I said, "ready to sell?"

"Cause you can't just have it lying around—unless it's pure. And

to be buying it pure, you can't be buying eighths, you can't be buying halves, you got to be buying kilos, which I can't do yet. You see, you don't be pre-cuttin coke. It doesn't last as long. Cut eats coke up, eats up the potency. I could take an eighth of pure coke home for two weeks, say, and it'd still be good. I take an eighth of cut coke home, and in a week it gets kind of, you know, weak. So you don't cut coke until you're ready to sell it. You cut it as the orders come in. So the way to have some weight at your stash is to be buying pure, and you build it up. Same with scag, except that scag will stay longer. And you don't use quinine with coke like you do with scag. Quinine will eat up the coke. Quinine gives heroin a rush, but there's other things that give coke a rush and don't eat up the coke."

"Like what?"

Jimmy smiled mischievously. "Like other things. See, you cut coke with lactose or dextrose, or both. I add a little of another thing which makes my coke superfly."

"What other thing?"

He smiled again. "Call it mysterious. There are certain things you don't want *nobody* to know. Got to protect my formula. Let's leave it mysterious. What I do is, I buy lactose and dextrose by the case, twelve containers to a case, and I usually use them together as cut. You get them in these plastic quart bottles." He picked up two opaque factory-labeled containers. "I mix them together. Then you got to sift them. You sift the cut to get the pure sugar out of it, the sweetness out. Then you sift the coke to get the biggest lumps out—although I leave in some of the rocks to show the quality. Then you weigh up the cut and the coke on the scale, then mix it together in a plastic jar."

"That's all?"

Jimmy raised his eybrows.

"I mean, it doesn't sound very complicated."

Jimmy looked at me through narrowed eyes and rubbed the tip of his nose. "Nothin is complicated," he said slowly, "if you know what you're doin. Now, some cats fuck around trying to be chemists. Good coke will numb your tongue, numb your nose. That's a way you can tell if it's good. Cats trying to be chemists will fuck around adding procaine and benzocaine and all those freezing agents to make the coke *seem* better. But you can taste the difference, because good coke doesn't have a freeze. Good coke has a numb. Procaine won't get you high. Benzocaine won't get you high. They're freezing agents, deadening agents. They'll freeze your mouth up. If you had an open cut and it was hurting you and you rubbed that shit on it it would freeze it, but it won't get you high. Nothing gets you as high as good

clean coke, sniffing it or shooting it. That's why you deal with somebody reliable, so you won't get burned." . . .

In general, discussion of the "drug problem" tends to be rabid and uninformed. Talk on cocaine is no exception. Cogent answers to the salient questions—How dangerous is cocaine? Is it addictive? How widespread is its use?—are scarce. And there is much authoritative contradiction.

One major problem has been, of course, that talk about "drugs" has lumped together everything from marijuana to heroin, as if central generalizations could be made (the blows struck by Harry Anslinger and his Federal Narcotics Bureau in the 1930's were powerful and have had lasting effect), although lately it has become acceptable to treat marijuana separately and somewhat more lightly. But cocaine and heroin are still almost universally united under the topic of "hard drugs" (a vague term used to imply serious danger) or "narcotics," despite the fact that they are medically and pharmacologically opposites. Indiana University sociology professor Alfred R. Lindesmith wrote in *The Addict and the Law* (1965) that the opiates (opium, morphine, heroin) "are so completely different from such substances as marijuana and cocaine that they cannot intelligently be discussed together with them."

First of all, one must define "addiction," and these days, in the matter of drugs, one defines it to taste. Generally now (one suspects in order to include marijuana, which has become increasingly difficult to call "addicting"), two types of addiction are described, one physical and one psychological. In the former, a test is usually whether the body develops a "tolerance" for the drug, requiring increasing dosage to achieve the same effect. That works for heroine or morphine, but killed it for grass, since authorities now wonder whether heavy users of marijuana might actually need *decreasing* amounts ("reverse tolerance") for the same "high."

Psychological "addiction" or "dependency," however, is a much more malleable term, and can be spread over any habit which is difficult to kick, from drinking coffee every morning, to picking one's nose unnecessarily, to cocaine. It can even be applied to a habit one simply *prefers* not to kick. By and large—risking a hoary generalization—people take drugs because they want to, whatever deeper spirits and humors are involved. In the case of heroin, whether one likes the drug or not, it is physically addicting and damaging to the body. What about cocaine?

In the thick fourth edition (1970) of *The Pharmacological Basis of Therapeutics* the authors set forth another definition: "If the term

addiction has meaning, then in terms of the compulsion to continue use, the degree to which a drug pervades the life of the user, the tendency to relapse following withdrawal, the compulsive user of amphetamines or cocaine is an addict." Such reasoning is circular, for a "compulsive user" would be one irresistibly drawn to the drug even against his will, ipso facto an addict. And such a definition excludes, then, those users who want to take cocaine.

On page 295 of this book is the statement: "There is some question whether tolerance develops to cocaine," followed by data to support this uncertainty. On page 381 is the statement: "Both addiction and tolerance can result from the continued use of cocaine."

The Dispensatory of the United States of America, another thick volume, is a basic reference work for pharmacists. In its twenty-fifth edition, under the heading "Addiction," are the following statements: "The habitual use of cocaine as a narcotic stimulant [a curious juxtaposition in a pharmaceutical work, since a narcotic—such as the opiates—is a 'down,' a depressant to the senses, a sedative, while a stimulant is precisely the opposite] is a problem of sociological importance. . . . The cocaine habit is not only one of the most seductive but also one of the most rapidly injurious and difficult of eradication of all drug habits. . . . There is a psychic rather than physiological dependence on the drug."

It seems to me that the last statement deflates the one before it.

In the fall of 1970, Earl Ubell, then science editor of WCBS-TV in New York, prepared and narrated a prize-winning series of reports called *Drugs: A to Z.* In it he stated: "Heroin is not the most addicting drug; cocaine takes that prize." That remark was followed on a later broadcast with: "Cocaine *may* [italics mine] be the most addicting drug known." He said a few moments later: "The usual dependence of heroin does not follow cocaine addiction. When the drug is stopped, the individual does not feel the same withdrawal symptoms as he would with heroin. But if he does stop the drug, the craving for it is excruciating [unlike heroin?] and he soon falls into a deep state of fatigue and mental despondency, so deep in fact as to sometimes cause suicide."

A search for answers is frustrating. One source says cocaine is addicting, another says that it is not; one says that cocaine abuse is widespread, another that it is not. Cocaine users perceive such terms as "cause suicide" as hyperbole. The potential drug user who seriously wishes to know the extent of the dangers, or who is at least willing to listen, quickly discovers that the information peddled doesn't check out. So he is likely to throw out the wheat with the chaff and believe nothing.

Here is a synopsis of the effects of cocaine from clinical sources: Cocaine is one of the strongest central-nervous-system stimulants known. As an anesthetic, it blocks conduction of nerve impulses when applied directly to tissues. It does not anesthetize unbroken skin, but is immediately effective on, for example, mucous membranes. It is ineffective * when taken by mouth—being rapidly detoxified by the liver—but highly effective on the central nervous system when injected into the bloodstream.

The stimulant properties first affect the cortex—the higher brain centers—making the user mentally and physically restless and active. It is a relatively short-acting drug, and for a brief time mental alertness may be heightened, reflexes quickened, and physical strength and stamina increased—though the latter may be an illusion due to the disguising of fatigue. It is a highly pyrogenic drug, causing body temperature to rise or fluctuate, and breathing may become shallow. As with the amphetamines, appetite generally lessens, and with repeated doses, the user can go without sleep for several days. In short, the central nervous system is hyperactive. While the user is "up," he may experience feelings of supreme confidence and power. In some it produces aggressive behavior or confusion. The user may become obsessed with detail.

Withdrawal from heavy cocaine use may be severe, producing extreme fatigue, depression, paranoia, and even psychosis. In acute cocaine poisoning, there is nausea and hallucination—[and] the sense that small things are crawling over one's body. Death may result from respiratory arrest, or, if cocaine is injected into the bloodstream, from cardiac failure due to direct toxic action on the heart.

There is no disagreement that cocaine is a powerful and toxic drug. But perhaps one problem with clinical discussion of drugs is that, however accurate, it seems unrelated to "normal" life. For example, a clinical analysis of the effects of alcohol is fearsome. But the nonalcoholic drinker may find it difficult to relate his alcohol to that of the laboratory—or the hospital. The same is true in the matter of cocaine. The terms "paranoia," "aggressive behavior," and "hallucination" (death is a concomitant of an overdose of so many things, from cyanide to salt) seem not to relate to what might be called "normal" use of cocaine—and in some respectable circles cocaine is used as "normally" as alcohol is in others. The effects of, say, ten snorts in an evening vary with the individual—just as do the effects of alcohol, marijuana, and coffee. Socially, such as at a party, cocaine users are typically alert, active, more confident, and more "open" or communi-

* Many authorities, including Freud, Mortimer, and Weil, have stated that coca and cocaine *are* effective when taken orally in sufficient dosage.—Eds.

cative (talkative people become more talkative). This is about the opposite of what happens at a pot party, where marijuana smokers tend to withdraw, and more resembles the early hours of a drinking party. Cocaine effects differ from those of alcohol in that users tend to stay alert and communicative as long as they continue snorting, whereas the activities of drinkers tend to deteriorate and become slow.

As the quality of a cocaine "high" is an individual matter, so is that of the "crash"—the descent from the "high." One may, after heavy use of cocaine for a day or two, feel profoundly fatigued for a couple of days after, and depressed as well (the two discomforts ordinarily go together anyway). But, as with an alcoholic hangover, a "normal" user of cocaine can usually predict his level of suffering, and whether you dominate it or it dominates you is largely a matter of individual disposition or personal will. University of Rochester psychology professor Dr. Helen H. Nowlis wrote in *Drugs on the College Campus* (1969): *"It appears that no known drug has effects which in and of themselves compel a normal individual to use them repeatedly. In other words, as with alcohol, we have to discover and identify for each drug the social and psychological factors which deter or facilitate repetitive use and dependence"* [italics added].

Unlike the amphetamines—which ironically may turn out to be more dangerous and habit-forming than cocaine—pure cocaine cannot be obtained by a doctor's prescription. In terms of dealing with "hard drugs," this is an important fact. A druggist's normal mark-up for profit on cocaine, were he permitted to sell it to private citizens, would put the price at something like $50 an ounce. A respectable druggist I know, who hasn't been presented a prescription for cocaine solution in ten years (the last was for a patient suffering hemorrhoidal bleeding), was the other day offered $1,000 for an ounce—about the going rate for pure in the underworld. . . .

Jimmy teased the powder with his good coke spoon. "I don't usually prefer it pure, but sometimes I come across a little, you know. I got some in the other room that's cut a half. That actually tastes better to me. But, aaah, that's there, and this is here, so . . ."

He snorted a two-and-two. "Hear those things dropping back in the paper? That's rocks. Don't snort the rocks. You got to be careful not to snort the rocks, because one can lodge in your nostril and burn the membrane and hurt you."

"Somebody told me that pure coke would make you sick," I said, "give you a nosebleed, headache, upset stomach, and so on."

"Who told you that? Somebody who doesn't really know. You talkin

about that drugstore coke? You can't go snortin that pharmaceutical shit. It's so strong it will wreck you—whew! But, yeah, this here can make you a little sick, depending on how much you take. Enough of it will give you diarrhea, that's for sure. Actually I like it better with a little cut in it, gives it a more pleasant hit. So usually when I come across a little pure like this I will add maybe a little less than a half to it."

"What do you do with the rocks," I asked, "just throw them away?"

Jimmy snapped his head up. "Do *what?* Hey, hold it! I hope nobody's throwin rocks away. The rocks are pure coke. Look here." He took out an aluminum-foil packet that had been passed on to him by a friend for a critique. He took a tiny single snort, and then sat pensively for a few seconds. "Hmmm, not too bad. But now, it could be better. See all those rocks in there? Okay." He folded the packet flat, and using the bottom of his lighter, pressed the package firmly, rubbing the heel of the lighter back and forth. Then he reopened the packet. "See? No more rocks. Now . . ." He took another tiny snort. "Much better coke. You just leave the rocks in there to show the quality. But there comes a time to mash 'em up, and that's when you are gonna snort 'em."

"How much do you snort in a day?"

"Well, if my woman is here, not much at all, cause she doesn't dig it. But I snort coke seven days a week. I'll snort a two-and-two just to open my eyes in the morning. Shit, I might snort a quarter—that's a tablespoon, a hundred and fifty dollars' worth of coke—in a day. Yeah, I guess that's a lot."

"So you're high just about all the time."

"Not necessarily." He stretched. "Oooh, yeah, tired all the time. I do a lot of runnin, you know. I haven't been to bed for a couple days. I'll sleep tonight maybe four or five hours."

"It's coke, isn't it, that keeps you going like that?"

"Shit no, man, that's all the sleep I need anyway. Lot of people get along with four hours a night. That's all I got when I was a nine-to-fiver. It's all in *here,*" he said, tapping his head.

"Are you telling me you're really not hooked on coke?"

"Hey," he said, cocking his head and arching his eyebrows, "there ain't no such thing. I've had it when I wanted it for a long time—I snorted my first coke when I was twelve. I don't think I *can* get hooked on anything. Cause when I want to stop, I stop—even if I been up a long time, cause I don't like for my body to *force* me to take it. So I stop, clean my system out, heal my nose up."

"You *do* stop?"

"Sure, I stop sometimes. I stopped about, oh, let's see, in the summer, for about a month, six weeks. Nothin wrong, just wanted to clean my system out. Phyl got on me, you know."

"Can she tell when you're high?"

"No, I don't think she can just look at me and tell. I don't change too tough."

"I can tell," I said.

"Yeah, well"—he smiled—"that's you. I don't watch myself too close around you." He examined his knuckles. "This may seem strange to you, but when I don't take coke I'm actually rather bashful." He rubbed his nose. "I can tell when I need to stop snortin. I'll be on it heavy, you know, snorting a quarter a day, and it gets to a point where you put your finger in your nose and get blood. Or my system doesn't feel quite right. I don't get the effect I should from it. Sometimes my speech might even get a little slurred. These are warning signs to me. See, if I get too high, I get dangerous. I get mean, hot-tempered. That is dangerous. Maybe some pissy-ass dude at the bar says some little thing I don't like. Usually I would just wave him away, you know, 'Come on, man, get away from me, don't bother me.' But if I have too much coke, I might fight the dude. Shit like that gets you in trouble. So when I begin to notice these things, I just get all coked up, have a good sleep, and stay off it a day or two. Doesn't bother me."

"And you don't feel depressed or anything, not like withdrawal?"

"No, man, it's all in *here*"—tap, tap. "Now, the reason I coke up and then go to sleep is so that when I come down, I do it while I'm sleepin. And anyway, so what if you feel a little tired? So what if you feel a little depressed? That's just the way it is. I don't let that *bother* me. Fuck it, you know, I can stand a little discomfort. You get to know your shit. You know when to stop and when to go. And you control it, man, don't let no drug control *you*. A *man* can do anything he wants. Now of course if you go to mixing things, like alcohol, that's something else again. Then maybe you get depressed and down and shit. I don't drink. You know why? Cause I get nasty and mean when I drink—like with too much coke—and when you get nasty and mean you make mistakes. I used to drink—shit yeah!—in the service we used to drink every night. And every night fight some dude. Every morning wake up with bumps and bruises. Can't be fuckin around that way in this business. So I don't drink."

"With so many other things to take," I said, "so many other ways to get high, it surprises me that so many people take coke at those prices."

"What other ways to get high? Scag will kill you. Pills are dangerous, they fuck you up internally. Occasionally it's nice, it's different—I have

sometimes mixed a little amphetamine with coke—but a regular thing on pills? Fuck you around! Amphetamines give you gallstones and shit. . . .

"Now, there's hash, but good hash is hard to come by. So that leaves grass. You see, you don't really have much of a choice. Best high in the world for me is coke and reefer. Coke is an up, and reefer is a down. They work well together. Snort a two-and-two, a three-and-three, and smoke a joint—aaaah! Or better still, good coke and good hashy—aaah, that's a boss thing, man."

"But not everybody can snort coke," I said, "not if you're going to spend fifty dollars in an evening just on that."

"That's true, unless you got long dough. If you bought half a quarter of something good, cost you seventy-five dollars. Now, you take half a quarter that costs you seventy-five dollars and put a half on it, cut it another half, that gives you three-quarters of a tablespoon, right? And it's good. You got a blow for Friday, Saturday, and Sunday. You got a blow for the weekend for you and your woman. That's a nice amount of coke, for somebody that's a snort, you know. That's about a ten-and-ten a day for two people. But what happens is that when you snort coke you get open, and you want more. You want to keep that high going, and you keep it going. You can snort up easy forty dollars' worth in an evening! I just had a two-and-two a half-hour ago. That's at least ten dollars' worth of blow, probably more with that quality. I don't feel that coke now, it's on the way out. So okay, I'm ready for another two-and-two. That's twenty dollars. So if you're the average person, you will do it usually when you're ready to go out. You're all dressed and ready to go, and you get high. You take some with you, and you might halfway through the evening go into the men's room and take another two-and-two and keep your thing up. Now, how long you stay high depends upon the snort and the quality of it. On the average I got something that's on a one for my personal. Snort up say a three-and-three, might last you an hour or an hour and a half. Now, two twenty-dollar caps could probably keep you nice for an evening. Then if you got a broad that digs coke, it costs you eighty dollars. But you can't expect an hour-and-a-half high on a two-and-two commercial. If you really want to get coked up and nice, you got to take a three-and-three or a four-and-four. Then in a half-hour or so take another one-and-one, and keep doing that to keep the high nice, cordin to how you like it. Some people might like to come all the way down, and then hit another three-and-three to shoot back up there. Cordin to what you like. But it costs to keep a coke high for an evening.". . .

"You ever shoot coke?"

"Yeah I do it sometimes. Mix it with water. You get superhigh, much faster, it lasts longer, and it's much more dangerous. It's *very* habit-forming."

"The books on the subject say an injection of coke lasts just a few minutes."

"They do, huh? Well, that's interesting."

"You say that shooting it up is addicting?"

"Well, maybe it's not a habit like a scag habit. It's a dependency. It's psychosomatic."

"Maybe," I suggested, "it's not addicting in the sense that you don't have to increase the dosage all the time."

"Yeah, maybe that's so." He turned away from the bed to face me, and extended his left arm, pulling up the sleeve. He traced a finger along the large vein above the wrist. "But I know cats that are strung out on coke, man, cats that have large tracks along here. Man, they have *tracks.* And they don't shoot nothin but coke. Scag you can mainline or you can skin off. Coke you can't skin. You must hit the vein or you don't get nothin, it's waste.

"Shit yeah, I've tried them all, man, mostly because it's to my benefit in this business to know how everything works."

On one bright fall day, when *The New York Times* proclaimed the arrest of "the number-one pusher of drugs in Harlem" and the smashing of his "$1 million cocaine smuggling ring," I stopped by Jimmy's apartment to see how that might affect his operation.

Jimmy rubbed a swollen knee, which he said had been damaged in a recent collision with the chin of a recalcitrant debtor. "Hurts," he said, bending it slowly and listening to it crackle.

The newspaper story, quoting the U.S. attorney, declared that the man had been arrested for conspiring to import a kilogram of pure cocaine from Ecuador and Colombia. Jimmy scoffed at the news. "Shiiit, every dude they bust got to be the biggest pusher in Harlem, the biggest this, the biggest that. That's how they tell themselves they're getting somewhere. A key, that's what they arrested him for? Shit. I stopped by to cop today, and my man's got eleven keys lined up. I've seen him with sixteen keys. And he's not the biggest there is."

I had come to share the sense that official valuations on official efforts are capricious, as in the matter of drug seizures, for example. The particular kilo of cocaine we were discussing had been valued at $600,000 by police, though Jimmy couldn't figure it to be worth more than $250,000, even broken into the smallest—most expensive—street denominations. . . .

I asked Jimmy, "If somebody gave you twenty thousand dollars today, what would you do with it?"

He smiled. "Okay, twenty grand today? Sure, I'd invest it in myself. I'd invest it in coke. Twenty grand? I'd get a key and a half. But you know how much that's worth? A key of coke costs you, let's say, fourteen thousand. You know how much you can make with it? Forty, fifty thousand dollars in a week, or two, with ease. Now, the very best coke can take a four—you can cut it four times. Commercial coke on the street has usually been cut three times. I can't buy coke that will take a three. Best I can get might take a two and a half. Cause you got to be buying pure coke to get it to take a three. You got to be buying a key to get it pure. Now, with twenty G's I would buy pure coke. I would have to go higher than my guy. He would charge me more than I would be willing to pay. There's a few places where they don't sell a half key or a quarter-key. The least they would sell would be a key. So I would purchase on that level. But after I purchase on that level, I would come back to this same level I'm on now and deal.

"In other words, I would not buy a key for fourteen thousand dollars and put it on a one and sell it double the money at twenty-eight thousand. That's no money, doubling my money. When I could take a key that was worth fourteen thousand and turn it into forty thousand by selling eighths, pieces—you dig it? The lower you sell, the more you make. So I'd sell it on the same level that I'm on now, cause that's what I sell now, eighths, pieces, every now and then a quarter of a key. There's always more money to be made at the lower level. The money is bigger, but the turnover is slower and the risk is greater. The smaller you deal, the more people you might see. That's dangerous. Here's a man sees two people a week, sells a key apiece, makes X amount of dollars. Now, each one of these cats takes their key and sees three cats. And each one of those three cats sees five people. More risk, but the money becomes greater.". . .

"You told me you made an average of five or six grand a week," I said, "and you don't pay taxes. Where does it go?"

"Yeah," he sighed, "where does it go? When you make that much cash, though, you gotta figure how many people you're paying off, you know. It's a lot of money to make, but there's a lot of bills incurred. Gotta pay for the product out of the cash that comes in. And then you gotta pay the workers. So you got the payoffs and the workers, and then you have what's left. Sometimes all of it's left. Sometimes none of it's left. I've still got the same goal. Might take a little longer. See, a lot of it is on paper. Like, if I left the business, I could collect it.

But it's out there. There's about fourteen grand owed me in the street. That should never be more than maybe six grand, but money is tight. I got to lean a little bit more, let 'em know I need mine, and it works.". . .

Jimmy was on the phone. "Hey, you remember that baby was up here last week? Yeah, well, her sister is around. . . . You been down to the movie? . . . Yeah, and also I got ahold of the rings on that matter. . . ."

He hung up and leaned over to pick up a joint. He lit it and turned to me. "See, that was all code. Baby—that's coke. That's what that means. And we talked about the movie, had he been down to the movie—that's about reefer. Then we talked about a ring, that's my new roscoe, my new gun. You never know about the phones."

He took a deep drag on his reefer, and held the lighted tip under his nose. "Yeah, yeah, it can be done. It can be done. That was one of my suppliers. He's becoming an ex-supplier. He is retiring. He wants to sell his apartment for about five thousand dollars, leave all his furniture and shit right in it and sell it and get out. I think he sold about fifteen keys every three or four weeks for about six months. He's *got* to have three or four hundred thousand dollars. Bought a home for his parents. Hey, when you get it that big, when you really get a nest egg, cut it loose. It's getting there that is the thing. But it can be done. You work your way up."

"Are you working your way up?" I asked.

"Shit yeah. Takes a little time, a little luck."

"How many guys in this area are dealing on your level?"

Jimmy pursed his lips. "Well, let's say in a ten-block radius, I'd say about three or four on *my* level. But now *dealers,* there might be three or four *hundred* that call themselves dealers, because everybody who sells drugs is a dealer of sorts. And users, wheew! But then you get into a thing like how do you tell who's a dealer and who's a user, you know. I'm on a high level now as far as I'm concerned. I've worked out a thing where I get half the stuff with cash, and half on consignment. We're talking about a seven-eight-thousand-dollar package. Not that many people have that for coke. Guys above me are only above me in dollars and cents."

"What else is there," I asked, "besides dollars and cents?"

"Well, look at it this way: I provide a guy above me with an outlet. Hell no, he's not really on a higher level. Without me, what would he do with it? It's not that easy coming off with large quantities of drugs.

"But, okay, start at the beginning. Now here's a cat and he buys at a very low level, and deals on the lowest level, right to the street. So

he's a pusher. He sells ten-dollar blows, twenty dollar caps and shit. So he wants to get a little higher, and his dough is getting a little longer, so he buys bigger, right? But he's still going through a man that's coming to me. Now the pusher might know that it's me that the last man is coming to. But for the pusher to come directly to me, you know, you just don't do that. Who the fuck are you? There's people at that low level who know that I deal in good coke. But they couldn't fuckin mess up their faces and come to me and ask me for no drugs. I'll bust 'em in the head. Like nobody off the street comes up to me and says he wants to buy a bag. I don't *talk* to those motherfuckers. They don't come *near* me. That's the way it works, just like the Army. I don't talk to the cat that's two or three levels above me. I talk to my supplier. He talks to the organization above him.

"Now, a lot of times I'm not out there selling anything. I'm just out there making sure that the cats that are selling for me are selling. I'll be in the bar where I hang, and there'll be maybe two people in there selling stuff for me. And I have people who won't buy from them. Like one cat will come to me and he'll say"—Jimmy pouted his lips and jammed his chin onto his chest and affected a deep, raspy voice—" 'Hey Jim, I want to buy from *you*.' And I'll say, 'Hey, man, you know that's my product.' And he'll say, 'Yeah, but I'd still rather get it from you, man, cause I don't know that motherfucker. He could be messin with me.' Cat will talk like that cause, shit, he wants to be coming directly to me. It's a prestige thing for him. But I know the dude, so I go for it. But usually you don't do that shit. You deal with the man at the right level."

"What if a guy came across some big money suddenly," I asked, "and wanted to make a jump up?"

"No. See, if you were buying twenty dollars' worth of coke regularly, and suddenly you went to the cat who's been selling you twenty dollars' worth of coke and ask him for a thousand dollars' worth of coke—hey, that's not real. Cat who's buying small quantities of coke suddenly shows up with ten G's. Hmmm, where'd he get the money all of a sudden? Will he be coming back? Could be the PO-lice. Police do that shit. Suppose the CIA or the FBI or the Secret Service or whatever came to me and said, listen, we want you to become an undercover man for us. If you don't, we're gonna kill you, or whatever. For some reason like that I become undercover. You know how many people would go to the penitentiary? You know how many people I could bust? I could dry up New York damn near, by what I know. So all of a sudden I'm undercover. I don't act different. But people start getting popped here and here and here, you know. Maybe I'll take a fall to make it look good, buy my way out of it. In the business, they

call that going bad. And it's dangerous. Who isn't vulnerable? Man who busts you has the right to say I'm gonna put you in jail for thirty-five fuckin years, unless—Hey! Thirty-five years? Ooh, fucker gonna give up *God* for thirty-five years. Shit, for thirty-five *months,* man. Whew! So you watch out for cats with that big bread all of a sudden. Cats don't just jump upstairs like that, one day with nothin, the next day with big bread. You don't want to touch a cat like that. To know who the big man is is one thing, but to approach him is a no-no. You work up.

"Here's a man, say, that buys a thousand dollars' worth of coke every week, every week. And all of a sudden he starts buying two thousand—that's not too big a jump—but he's steady with it. Now, you figure that the extra thousand is maybe not his. He's buying it for somebody else. But by now you know the cat, you've watched him. And then after a while it goes to three thousand. But his thing is still consistent, so that means that someone else is in it, *stayin* in it. So now the cat comes to you and he says he's been spending good money and now he wants to meet the man you cop from and do a direct thing. In other words, let's say you do it consistently every two weeks and every two weeks, then you can demand a bigger man, maybe not the top cat, but somebody.

"That's like how it was with me. There's a cat that I used to buy through. He used to get my coke for me. And I started buying bigger and bigger, through the same cat. But it was consistent. And I got to the point where I was buying more coke than he was buying. He could get it, but I knew that my supply outlet was bigger than his. So I said, like tell your man that I want to meet him because, you know, otherwise I'll take my business elsewhere.

"What happens is that if you been doing it long enough and you sound reliable enough—cause people get checked out, you get to hear things and whatnot—you get to know the dudes involved. You feel your way, and eventually—well, in my case he finally said to bring me by, he'd like to meet me. So he cut me into him directly. So now this dude that I used to buy from, for a while he and I were on the same level, buying from the same man. Now he's still where he was and occasionally when he can't get in touch with that man he comes to me for product, so actually I have moved above him.

"You see, the whole thing is getting yourself in a position to cop big. Now, I got three or four levels of guys between me and the street, for safety. Trying to get further away from it, the further the better. And the guy below me, he has to want to be a small *me.* He's aspiring to get to where I am, and I'm aspiring to get to the top. And as I move up it creates a void that he can fill, if he's got the ambition, if he really

wants the cash, and unless he takes a fall. It's a constant struggle, you know, until you get there. The trouble is, you get to a level and something goes wrong and you go toooosh, and you got to start all over again. But once you get there—aaaaah!". . .

As we were riding one day, police cruisers around, people looking at the car, it seemed to me only logical that Jimmy should be followed.

"Why *don't* you get followed?" I asked.

"Who by?"

"The police, of course."

"What for?"

"Well, for chrissake, because you're dealing drugs."

He raised his eyebrows and looked at me out of the corner of his eye. "You think that's obvious?"

"Well, not obvious, I guess," I said, "but here you are, driving an Eldorado. If a cop followed you for a couple days, he would have you, wouldn't he?"

Jimmy shrugged. "But *why* would he follow me, unless . . ." He chuckled. "Unless you *told* him."

"Mmm," I said, looking out the window.

"Look," he said, "okay, here's a young man, looks like he's under thirty, driving a Cadillac that's fly. But what is that saying? Look at all the Cadillacs around here. Don't you know young people driving Cadillacs who aren't hustlers? And man, the *number* of hustlers around here, whew! And not all of them deal in drugs. But let's say the Police Department assigned one man to follow each guy they thought was dealing drugs of *some* sort. There would not be any policemen left in the street.

"Now, in the bars, sure," he went on, "might be some people figure what you do. Maybe there are some dudes be happy to run it to the police for a few dollars. But to figure is one thing, to know is another, to be nosy gets you killed. In the bars where I hang, everybody is known. Somebody walks in that isn't known, and tsssh, everything stops. You're the police, whoever the fuck you are, whatever color you are, until somebody that is known proves otherwise. I say *proves*, man. You walk in there with somebody not known and you better be ready to prove it, because there'll be some suspicious dudes ready to follow you out. That's real." . . .

We rode in silence for a while. "I don't know," I said. "If I carried the stuff you do, did what you did, I don't know what I'd tell a cop."

"Oh, *man*," Jimmy said with a pained expression. "Cops got no right to . . . Hey, listen. The police stopped me the other night. Friday night, up here in Harlem. My taillights weren't working. So

the cop stopped me and told me my lights were out. I jiggled the switch, and they went off and on, cause the electrical system had a short. So at that point the cop could see that something was wrong with the switch. And it makes sense that I wouldn't know that, because, you know, it's a new Eldorado. Okay, so this cop was very polite, and I was very polite—that is always my come-on, I am not belligerent—and I showed him my license and registration, and he was satisfied.

"Now, at this point his partner got out of the car. Dig that it was two white cops in Harlem. The first cop was satisfied, now his partner wants to hassle me. 'Where you goin?' this second cop says. Where am I goin? Where am I *goin?* What do you mean. where am I goin? None of your fuckin business where I am goin."

"You talk like that to a cop?" I said. "Isn't that asking for trouble?"

"What? Let me explain something: There are things the police can do and can't do, unless you let them. Hey, if you cower to the motherfuckers and quiver, first thing they'll do is say, 'Open the trunk of your car!' That's illegal, but they do it every day. They do it so regularly that they don't expect any static. Here's a young black dude in a Cadillac, we'll just fuck him around. But when you come off with, 'None of your fuckin business,' they know they can't do that shit."

"Supposing you annoy them and they arrest you," I said, "even on some silly charge."

"Bet that! Arrest me! Take me to the station, and what do they tell the sergeant at the desk? My taillights were out? Now, the sergeant doesn't know who I am. Think about it. There's some hustlers out there that know some righteous motherfuckers, so they got to be careful. The sergeant doesn't want to get in any trouble just because this one cop is sore. And I am polite to the sergeant."

"What if they're all trying to shake you down?"

"That's not real, because then the first cop would have started it. But, okay, you get to the stationhouse, and it comes off like a shakedown. Then you rap: 'Listen, I know this is a shakedown. You know this is a shakedown. And when my lawyer gets here, I'm gonna sue you motherfuckers, cause I got the time *and* the money.' See, that's the whole gimmick. You gotta be willing to take it to the max."

"Supposing they just wanted to rough you up, or they frisked you and found your gun and some drugs?"

"Hey, frisk *me?* How? They can't frisk you, not because your taillights were out. They must have reason to think that you are a felon. And listen: I'm not gonna stand and let anybody feel me, touch me. I don't allow that shit. In order to take me to the stationhouse they either got to be arresting me, or taking me for questioning. Taking me

for questioning, they cannot touch me. And they got no felony charge to arrest me on. What the fuck are you just gonna be pattin on me for?

"And rough me up? It would not be cool of them even to try, because nine out of ten of them I think I could kick their ass. Shit, I'm a brown belt in karate. Two uniformed cops? And if it comes to a takeoff thing in the street, don't forget this is Harlem. Now, they pull their guns, they better mean to shoot, because I'll try and kill both of them, and I have the edge because I know what I'm about to do, and they don't.

"But see, again you have to dig, if you're a cop you deal with people. If a cop walks up on a cat, and he comes down a certain trail, out of a certain bag, you know what he's gonna accept and not accept. A cop gets to know these things just like I do. Oh sure, there's some cops who have to prove themselves every day, their manhood is in doubt. Some cops will fuck you around, plant stuff on you to make a bust and shit. Oh yeah. That's why they get killed every day. You remember that time those two cops—somebody put in a call that something was wrong, and the two policemen showed and got out of the car, and a sniper was waiting for their ass? You wanna know why? Cause those two motherfuckers had kicked somebody in the ass, had fucked somebody around. And that same somebody was waiting on their ass when they showed. That's why you read about cops gettin blown away. For no apparent reason some fuckin dude shoots a cop. But there's a reason.

"So I always come on nice, but don't think that means I'm stupid or that I'm gonna let you ultra fuck me around. I'll take it wherever it's necessary. These two dudes that stopped me, they're not detectives, you know. Detective stops me, I'd be very cool, careful. Because a detective can watch you and fuck with you. A uniformed cop can't do that.

"So anyway, this motherfucker says, 'Where ya goin?' And I said, 'Listen man, if you're not fuckin satisfied arrest me.' And as I said that, I opened my car door and got in and slammed it and started my car and split." . . .

Jimmy held in front of him, for me to see, a clear plastic bag of shiny crystalline pure cocaine that weighed 425 grams, a little less than a pound. The bag, he said, had cost him $4,400.

Jimmy was now buying pure coke. . . .

So for my benefit he was presenting this show of progress in his living room.

"I used to sell ten-dollar blows," he said, teasing the cocaine with the plastic card, and me with his smile. "But no more."

He wasn't wearing his gold spoon, so he creased a matchbook cover and scooped up a bit of the mix. He snorted a two-and-two and nodded. "Now, coke like that, with a two on it, soldiered right through. That is good coke."

"So now you're buying pure," I said.

"Mmm-hmm."

"What happened?"

He chuckled. "I got bankrolled."

"You really have a backer?"

"Mmm-hmm."

"Why is he backing you?"

"He believes. He believes. He's done what I'm trying to do. He's successful. So I guess he feels he can make it on my success too. It's a good investment. If you invest, let's say, ten thousand dollars for sixty days, and you can make twenty thousand—where can you do that in the street? Now, when I say sixty days, you know who's getting the benefit of *that*. Cause in sixty days I should be able to *triple* the money. I'm gonna try to make it four times as much. Shit, I gotta make some money too, since I'm doin all the work. And if I do it very carefully and good, it can happen. I've never had a backer before. Let me show you something."

He reached over to the end table and from under a towel took a .38 Smith & Wesson snub-nosed revolver, and six bullets. "See this? I think maybe you've seen this gun before. But look at the bullets."

They were hollow-tipped, the kind that blow open inside and leave a bigger hole where they exit than they did where they entered.

"This is a kill gun," he said soberly. "See, copping what I'm copping now could put me in prison for life, if I was caught. Hey, I'm not going to prison. So there are certain situations that would call for a shoot-out. So when I'm copping these amounts, I carry this gun. And I would kill anybody that tried to stop me."

Jimmy hissed and shook his head. "You know, this administration is insane. They actually believe that if they make the penalties stiffer, they're going to get the dealers. Hey, listen: Have you been digging how many cops have been shot in the last couple weeks? Nine cops! Now, doesn't that say something to you? You come upon me to bust me now, and that bust means I will serve a minimum of twenty-five years in prison, all the way to *life!* I would be almost sixty years old when I came out, at the earliest. So what does that say? That says that when you bust somebody like that, he's going to try to kill you. Let me tell you something. I think I would rather die in a shootout than go to prison for twenty-five years. That's what this administra-

tion doesn't understand. Do you really believe that I would go to prison for that length of time? Here I would be, a sixty-year-old nigger with no education. No, no, no. I would rather kill a cop." . . .

Jimmy took the gun back and put it down beside him. He picked up the phone and dialed a number. The person he wanted was not there, and he listened to some explanation, then put the phone down.

"Well, can you imagine that," he said, tilting his head back and looking straight up, then looking at me. "Did you know that today was Black Solidarity Day?"

Buying pure cocaine raised the specter of organized crime. Jimmy's view of his suppliers always was, "I treat 'em as individuals." In this case, now, on Black Solidarity Day, I pushed it.

"How about individuals getting rich on Harlem's blood," I said, "even the blood of the kids?"

"Hey, listen!" He faced me directly and gestured with a half-closed fist and an index finger. "You talk about getting rich on Harlem's blood. In Harlem the average income is about four thousand dollars or some shit like that. So you go in Harlem and buy a fryer, you know, a chicken, you spend a dollar and some change—say one-sixty for the sake of argument. Go over to the suburbs where the income is say fifteen thousand a year and buy a fryer of better quality for ninety cents. Now, that says it. Kids in Harlem get used to inferior shit—food, clothes, shoes, everything—it's all cheaper in the richer neighborhoods. If you were a kid in Harlem, what would that say to you? Somebody's exploiting the shit out of you! You think the kids here don't know that? It's not me that's exploiting Harlem."

"But you *are* dealing with racists."

"Oh there's cats I know who are uptight because I am black. I can see it in their faces. I get very sensitive and uptight about it, but I don't let it show. But then it works both ways. I know cats that I do business with that are black that are just as racially motivated—hey!—as bigoted as white fellows that didn't dig me. I guess you're liberal-minded or whatever and you figure the black cause is justified. Shit yeah, I do. . . .

"The Black Panthers are pretty tough on people who deal drugs," I said. "How can you talk to a Panther about your racial consciousness?"

"You're talking about *dope* again," he said with some agitation, his eyes now showing a spark. "I don't fuck with scag! That's not part of my operation. It's not my shot. My partner, sure. But I don't touch that personally. How many times a year do you hear about people

O.D.-ing on coke? It just doesn't happen." His voice softened slightly. "That's how I wash my conscience on *that*."

He leaned forward, eyes narrowed. "Listen. Some dude comes up to me and tells me about what I'm doin and gives me some shit, he's fuckin around and he's gonna get hurt. If I stopped doing what I'm doing, will it stop the money from going out of Harlem? If I stopped doing it, somebody else would go in and start. I have never seen a pusher go up to a junkie and say buy my dope, or I'm gonna bust you in the head. I have known a lot of pushers, and I have never known a pusher say to *anybody*, kids or whatever, come on and try my dope.

"Dig this: I know a motherfucker that sells dope to kids. He's about twenty-two, and his whole clientele is about fourteen to twenty-one. He's told motherfuckers, 'Hey listen, you're clean, don't start shootin.' But kids come, you know, and say they wanna try some dope. He might say, 'Look, if you wanna fuck with it, snort it, don't start shootin it.' Then some do and some don't. Now, if you want to buy, he'll sell it to you."

"You talk about it almost as if it were a public service," I said.

"Public service? Sure it is. It's entertainment." A smile came and went. "Hey, you know what would happen if all the dope dealers suddenly stopped selling dope? In Harlem? Do you realize that sixty percent of the black population, I would say, is hooked on drugs? They would get uptight and wouldn't have no dope. It would be a bitch in this town, for a long enough period to destroy the town. Oooh, man. You ever see a junkie couldn't get no dope? That's when he becomes dangerous. Junkie's a passive cat. Junkie shoots up and you could take him by the hand and lead him down the garden path and he'd go for it. But let him have no dope and he becomes sick physically, and a dangerous motherfucker."

"Would you consider taking your coke operation downtown?"

"Downtown where? Midtown Manhattan? And go to jail? When you don't be in Harlem to sell coke, you sell coke to white people. I don't know them like I know black people. I wouldn't try. Not unless I knew them personally."

"What if you had white guys working for you to take it downtown?"

"Again that's dangerous. I wouldn't be able to go downtown and check on 'em at will. I wouldn't know their clientele. I wouldn't know whether they'd turn me into the police. It would be dangerous, man. I have white cats that I do business with, but I *know* them. But they wouldn't come into Harlem and try to sell dope. Would you come into Harlem and try to sell dope if you were a dealer? Just like you'd be

conspicuous here, I'd be conspicuous downtown, I imagine. There'd be a lot of resentment for various reasons, you know. It would cause a lot of static, I think. I don't need it."

"You will not deny," I said, "that the harm is being done, that kids are using dope, and that the money goes out of Harlem and gets back to the Mafia."

"*I* am not selling dope to kids. *I* am not selling dope to junkies. *I* am not selling a habit. Sure, some people might say what you're saying. But a lot of those same people, they're hungry. How can you be a do-gooder or a righteous-righteous if you're hungry? How can you tell me I shouldn't sell coke when you don't know where the fuck the next month's rent is coming from? Ha!" . . .

"Do you know how and where your product comes into the country?" I asked.

"I'm not supposed to, nor do I need to, but I do. I try to make it my business to know. The more you know, the more you are in a position to dicker. Like when you know a shipment's coming in, you know that if you go just when it's coming in you're gonna get a better deal, cause they're fat. And if you go toward the end of it, when not much is left, then you'll probably get a little less quality. It works that way even when you're buying keys. I'm greedy. I want the best for my buck so I can make the most."

"How and where does it come in?"

"Can't tell you that. My man just gets coke. He doesn't bring it in. It's brought to him by somebody who's working for someone on his level out of the country. I think my man is the top man in his organization in coke. That is to say, anybody in his organization that wants coke has to go to him, no matter what level they're on. But as far as being able to have the last word about policy, there are a couple people above him that have the last word as far as policy goes."

"Tell me about your man. What's he like?"

"Well, he's my main supplier. I had two good ones. I have six or seven that I can go to, but I only had these two that were reliable. Now I have one, because the other one retired. Right now my man's got about sixteen keys. In a way, I think he's kind of a big freak. I think he gets his thing off dealing with the underworld. He doesn't have to financially. He's a very wealthy man. I believe he's got over a million. But he doesn't get hooked up, he's not flashy, no diamonds. He wears dungarees and shit like that. I don't know how he built his thing up, but he's got a couple legitimate businesses. Cat is very down to earth, very nice people, he snorts, smokes. We're friends. Like I go to his house for dinner. I know his wife and kids. I can go up any-

time and like, 'Hey man, I'm tired,' and he'll say to just lay down on the couch and sleep. I wouldn't necessarily have to have rapport with the cat to deal with him, but I do."

"When you make a connection, you call him and meet him here or there?"

"Never here, never there. Wouldn't do any shit like that in my house. That's dangerous. We use the car, restaurants, parks, highways."

"Suppose you got into trouble," I said, "could you go to your man with your problems?"

Jimmy nodded. "Uh, cordin to what the problem was. I would tell it to him and he would evaluate it. I know if I got into a jam they'd bail me out, you know, without a doubt. Like they'd go so far as to rough somebody off for me. I would not necessarily need to tell them why. I had some problems with a cat once, you know, Slick and I, and that's when I was told, 'When do you want him hit?' "

"You could ask for somebody to be hit?"

He shrugged modestly. "I didn't know I could. But he said, 'It's up to you. Use your own discretion from now on.' If there was a hit needed, he would make all the arrangements for it, and he went on to tell me, you know, I can call for it."

"Then why do you get involved with buying a silencer and so forth?"

"Cause I don't go to him all the time with my problems. That's why they dig me, that's why things are cool. I take care of me. Who wants my headaches? I take care of my own shit.". . .

"What would happen to you if they legalized cocaine?"

He cocked his head and raised his palms in "C'est la vie" fashion. "It would stop my hustle. I'd go back to work, nine-to-five. No big thing. It would have been like a large vacation. I had a groovy time. Fuck it. Now, I might become a dangerous motherfuckin menace out on the street, because when you ain't got nothin to lose, you say fuck it, burn the building down, it ain't *my* building."

"But it wouldn't bother you to go back to work?"

"Not at all. I've worked all my life. Now, if I'd been a hustler all my life and never worked, it might scare me. But I've worked, man. If I became a millionaire, and then lost it all, you know what I'd be able to say to the motherfuckers? Hey man, I had it. You know how many people go through their life and can't say they had it? I hope I'm gonna keep it, of course, but to be able to say I had it—shit, that's more than most. That attitude keeps you from goin broke. I expect to work until I die. If I go back to work, you know how easy things become? I don't have to worry about the police. Oh man, my ulcer would go away. Hey man, I'd be straight! Course I wouldn't have

nothin. I'd just be living from hand to mouth like every fuckin body else. Damn few make it big anyway. I know that."

Jimmy leaned back and opened his mouth to let some reefer smoke drift out. "You know what I want to do, really really? Go back to school. Get an education. I guess that sounds strange, huh? But that's important to me. I really want to."

ANDREW WEIL

The Green and the White

Andrew Weil is a fellow of the Institute of Current World Affairs, exploring the achievement of altered states of consciousness in our own culture and others. His best-selling volume The Natural Mind *(Houghton Mifflin, 1972), has attained world-wide recognition as a modern classic. While still at Harvard (where he studied under the dean of American ethnobotanists, Dr. Richard Evans Schultes), Weil pioneered with Dr. Norman Zinberg of Boston University in conducting scientific experiments concerning the effect of marijuana on human subjects. After graduating from Harvard Medical School, Dr. Weil worked at a clinic in San Francisco's Haight-Ashbury. He served for a period with the National Institute of Mental Health before writing* The Natural Mind. *After its appearance, Dr. Weil traveled to South America for further field studies. He describes his findings there in the following original essay.*

I If This Is Colombia, Where's the Cocaine?

Scene:

The international arrivals section of Eldorado Airport, Bogotá, Colombia, one night in mid-December of last year. Passengers who have cleared customs enter the long hall of airlines through double doors and are met by porters, friends, and taxi drivers. The author is sitting near by waiting to meet someone.

Enter through the double doors a man and a woman in their mid-thirties, Americans, non-hippies. The woman wears a long summer dress, the man Bermuda shorts—inappropriate clothes for Bogotá's 8,000-foot altitude. They might have just stepped off a plane from Miami. Both of them seem agitated. They look around, not sure where to go. The woman sees the author and walks up to him.
Woman (*breathlessly*): Excuse me, do you speak English?
Author: Yes.
Woman: Well, we just got off the plane this minute. Can you tell us where we can get some cocaine right away tonight?

When I first came to Bogotá in 1965, Eldorado Airport was less fancy but more hospitable. As soon as passengers cleared customs they were ushered to a round pavilion and served free cups of delicious coffee, compliments of the national coffee-growers association. Today, free samples of cocaine might be more to the point. A great many visitors to Colombia have cocaine uppermost in their minds, and it is said that the amount of money involved in its illegal export to the north makes it at least as important economically as coffee.

It is not surprising that many of the cocaine seekers who come to Colombia are Americans. The popularity of cocaine in our country is at an all-time high. More important, its use has now invaded the world of the middle classes, just as marijuana use began to do a decade ago. One consequence of this change is a growing campaign on the part of middle-class lawyers, doctors, and educators to convince the public in general and judges in particular that cocaine is much less harmful than our laws make it out to be. For example, a number of test cases are now pending in state and federal courts throughout the country that might result in removal of the drug from its usual classification as a narcotic (along with heroin and other opiates) and in a lowering of penalties for its private, recreational use.

Many people who try cocaine in our country must wonder why it is so popular. It is a very expensive drug, often selling for as much as $50 a gram or $1,000 an ounce. (The legal retail price in the pharmaceutical trade is $25 an ounce.) Usually, it comes as a crystalline powder in various shades of off-white. Some people shoot it intravenously like heroin, but the vast majority of users snort it. When snuffed up the nose, it very quickly produces a strong sensation of numbness in the nasal passages and throat. Often, American black-market cocaine does little else, and it is curious that people pay so much money to have their noses numbed.

The trouble is that most cocaine is highly adulterated before it reaches the individual consumer—usually with amphetamines, which

stimulate by the nasal route as well as by the oral route, and also with procaine and other synthetic local anesthetics that mimic the numbing action of the real stuff. Real cocaine, in addition to its local effects, provides a warm glow of physical and mental well-being, a feeling of energy and clarity without much of the body stimulation of amphetamines or caffeine. But this feeling is subtle and may require learning to perceive. Even with good cocaine, first-time users may not notice that they are high.

What cocaine seems to have going for it mostly is a powerful mystique. It is the rich man's drug, the drug of exotic decadence, a magic tool to prolong and intensify sexual experience. Moreover, the ritual of huddling together to snort precious grains of a forbidden delicacy has a certain romantic charm.

Until recently, it was much easier to come across good cocaine in South America than in North America. I tried it perhaps half a dozen times in the U.S. without ever feeling much beyond my nose and throat. Then, one afternoon in Cali, Colombia, at the apartment of some American dealers and musicians who loved cocaine, I complained that I had never really felt high from it. "Wait till you try this," one of them promised, chopping up the crystals with a razor blade and arranging them in thin lines to be snorted through a rolled-up 100-peso note. I inhaled one line in each nostril, got the usual sensations, and then, unexpectedly, a strong feeling of strength and health that seemed to flow through my lungs into my chest and whole body. My mind became alert, calm, and clear, and I remained in that agreeable state for a couple of hours, after which I felt tired.

But that was two years ago. Today, much Colombian cocaine is as bad as most American—a logical result of so many northerners coming down to score. My friend Jimmy, who knows his coke and has spent a lot of time in places where it is sold, tells me the quality of stuff on the Bogotá market has so declined in the past year that he is seldom tempted to buy any more. "I've even seen it cut with borax," he says. "These gringos come down here from New York and L.A. and think all they have to do is buy the first blow they see on the street, and it'll be better than anything they can get up there. And the Colombians have learned they can sell just about anything and get away with it."

One thing I have noticed about the many gringos who come to South America to buy and use cocaine is that very few of them have any knowledge or experience of the plant that provides the drug they enjoy. That seems to be true also of the South Americans who use and traffic in cocaine. Yet the coca plant—"Mama Coca" to the early Spanish conquerers—has been and is an honored presence in

the everyday lives of millions of native peoples of the New World. Its therapeutic values so impressed Europeans that they carried its use enthusiastically from the high Andes to their own continent. Only in this century has coca fallen into disuse among Europeans and Americans. And that disuse has been accompanied by increasing use of cocaine, the so-called active principle of the coca leaf.

Observations that point up distinct contrasts in the effects of coca and cocaine will suggest that all of us might benefit by paying more attention to the living shrub whose leaves were sacred to the Incas.

II Green Stuff

The coca shrub, *Erythroxylon coca,* is widely cultivated in eastern Peru and Bolivia, its probable area of origin. It grows there in the lush, green valleys of the eastern slopes of the Andes—a region known as the Montaña—often at altitudes well above 5,000 feet. It is also cultivated, though less extensively, in northern Chile, Ecuador, southern Colombia, throughout the Amazon basin, and in many parts of the Old World, principally Java and Ceylon.

I first saw living coca while traveling by car in Bolivia nine years ago. Steep hillsides were planted with the neat shrubs, most of them about three feet tall. And in La Paz, the Bolivian capital, whole sections of the open Indian markets were given over to coca vendors. In these markets, rows of Indian women sat in identical postures, each before a mountain of dried coca leaves on a blanket. Each woman had a balance and a supply of large plastic bags, and for about twenty-five cents one could buy a great bagful of coca. Also set out on the blanket were molded, dark-gray shapes of highly alkaline substances that must be used with the leaves. The alkaloids of coca are not released from the leaf except in an alkaline solution; Indians in different parts of South America have come up with different ways of alkalinizing their saliva.

In some places quicklime is used; in others, powdered seashells rich in lime or the ashes of various plants. In Bolivia, most commonly, stalks of the quinoa plant, a local grain, are burned to ashes, mixed to a paste with water, then molded into shapes and dried. Sometimes this material is called *lejía,* the Spanish word for "lye," and it must be used with care because it is highly caustic. The first time I bought coca in the La Paz market, the woman who sold it to me showed me how to put a handful of dried leaves into my mouth, moisten them into a wad, then bite off a tiny chunk of *lejía* and mix it thoroughly with the

wet leaves to avoid having it come into direct contact with my tongue. (I still got a few minor burns before mastering the technique.) The alkalinizing substances differ in strength and flavor from region to region. In parts of Colombia, coca-chewing Indians carry small gourds of white powder (called simply *cal,* "lime"), which they spread on their quid of wet leaves with a stick. At times I have found it easier to use pinches of ordinary baking soda than the more powerful types of Indian "lye."

The flavor of coca is quite delicious, especially mixed with a bit of *cal, lejía,* or baking soda, all of which add a nice saltiness. Most plants that contain alkaloids are bitter, and many leaves contain astringent tannins, but coca, especially when freshly dried, has a pleasing taste that most people like right from the first. In chewing coca the idea is to build up a chaw of leaves about the size of a walnut and to maintain that between the cheek and gums, letting the juices trickle down the throat. The leaves are not swallowed. After forty-five minutes or so, all the active material is extracted, and one can spit out the remains.

During the time that I stayed in La Paz it was very cold in the mornings, and the lack of hot water where I was living made it an ordeal to get out of bed. I found that a morning chew of coca made it easier to start the day. I had never tried cocaine then and had no particular expectations of the leaves except that I had read a number of testimonials about them. I enjoyed the taste and the novel sensation of numbness in the mouth and throat, but I was disappointed that I did not feel high. At that time I did not realize that the high of coca is subtle, that it requires learning to appreciate, and that [one's psychological] set and setting play a great role in shaping it.

I brought a bag of coca leaves and a bar of *lejía* back to the States from that trip and kept them around as curiosities. I remember that during my second-year pharmacology course in medical school, I shared them with several of my classmates and showed them how to chew. All of us experienced anesthesia in the mouth and liked chewing the leaves, but, again, none of us noticed that we were high. Thereafter, I lost interest in my bag of leaves and eventually threw them out.

I did not come across coca again until a number of years later in the Colombian state of Cauca. Cauca is a mountainous region of southwest Colombia, and many of the Indians who live there are *coqueros.* But in Colombia, unlike Bolivia, coca is technically illegal. The leaves are not sold publicly except in small quantities by vendors of herbal medicines. In Popayán, the state capital, one can buy cocaine with ease, because the city is on the Pan American Highway. Much of the cocaine extracted in illicit laboratories in the Andes makes its way through Popayán en route to Bogotá and points north. But to get coca

leaves in Cauca one must go to the hinterlands where Indians raise the shrub for their own use.

On one of my visits to Cauca I got some leaves from friends and chewed them with a bit of *cal*. That time I noticed the high, and the experience left me eager to find out how to use the plant for best effect. Soon after, I met some Americans who were living in a remote valley, several hours hike over difficult terrain from the nearest village. They told me that coca made it possible for them to hike back and forth when they needed supplies.

Chewing coca to hike in the mountains is one of the most traditional uses of the leaves. Ancient Inca runners relied on coca to cover great distances in the high sierra, and their modern descendants still measure the length of journeys in terms of the *cocada*—the period of time that one chew of coca will sustain them. There are many reports of Indians being able to endure great physical hardship with little food as long as they have adequate supplies of coca. Here, for example, is a description from 1913 of the endurance of Indian porters near Popayán:

> After eating a simple breakfast of ground corn porridge, they would start with their heavy packs, weighing from 75 to more than 100 pounds, strapped to their backs. All day long they traveled at a rapid gait over steep mountain spurs and across mucky swamps at an altitude that to us, without any load whatever, was most exhausting. On these trips the Indians neither rested anywhere nor ate at noon, but sucked their wads of coca throughout the entire day. These Indians we found very pleasant, always cheerful, happy, and good natured, in spite of the fact that their daily toil subjected them to the severest of hardships and the most frugal fare.
>
> —J. T. Lloyd, A Treatise on Coca. Drug Treatise XXVII. Cincinnati, Ohio. Lloyd Brothers, 1913. pp. 12-13.

Firsthand reports about Indian uses of coca usually emphasize that regular chewing of the leaf is consistent with good health, high social productivity, and long life. Moreover, much of the literature on coca talks about the therapeutic virtues of the leaf: not only is it not harmful, it is said to provide nourishment for the body and to be useful in the treatment of many kinds of illnesses. On the other hand, some authorities who have no firsthand knowledge of Indians condemn coca chewing as a destructive habit.

To get more information on coca I decided to visit some Indians who use it regularly. I also decided not to do that in the Andes, where cocaine has become so prominent. On the advice of a Colombian botanist friend, I flew from Bogotá to Mitú, the tiny administrative capital of the huge territory of Vaupés, a stretch of the Amazon basin that borders on Brazil. Mitú's main street runs a few blocks from the un-

paved airstrip at one edge of town to the bank of the broad Río Vaupés at the other. In Mitú I found two Cubeo Indian boys who took me in a motored canoe up the Vaupés to the Río Cuduyarí, one of its tributaries, and then up to the Cuduyarí several hours to a tiny village of Cubeos. I was assured that the Cubeos use coca constantly and are amenable to visits.

I arrived near midday on a brilliantly sunny Saturday last January in the midst of Amazonian "summer"—the dry, hot season when the rivers are low and clear and tranquil. It was a steep climb up the riverbank to the village, a rectangular layout of ten thatched houses surrounded by forest. No one was outside; the sun was too intense. I had a note of introduction from the Catholic priest at Mitú to the schoolteacher of the village, but when I found his house he was out fishing, and his wife spoke only a few words of Spanish. The boys explained who I was, and she indicated that I was welcome to wait. She offered me a large gourd of *chicha,* a natural, fermented beer made from yuca (tapioca root), and a large chunk of cassava bread, made from the same root. There was a gourd of fiery hot sauce, made from chili peppers and fish, for dipping the cassava bread. As I ate and drank, the schoolteacher's wife went back to the cooking area and resumed her work of grating bitter yuca tubers—one step of the long process needed to remove their poisonous juices.

The house was spacious, dark, and unfurnished except for one table, a hammock, and a number of low, carved stools. An open fire burned low in one corner. I sat on one of the stools, looking out the door, relaxed by the rhythmic sound of grating. Outside, the sun was blazing. A few scruffy dogs lay in patches of shade, gnawing on fishbones. In the middle of the rectangular "plaza" of the village was an unfinished structure, the largest building of all, built of sturdy beams. I learned later it was to serve as a school and assembly house.

Before long the schoolteacher appeared with a mess of river fish. He was a short, intense man in a bathing suit and flowered shirt who spoke good Spanish. I addressed him as *maestro* and presented him with my note. He told me I was welcome in the village but would need the permission of the chief (*el capitán*) to stay. I told him of my interest in coca and he said there would be no problem in learning about it if I stayed. Then he told his wife to bring me another gourd of *chicha,* gave her the fish to cook, and played with his small children.

El capitán was an older man, very warm and thoughtful, who told me I could stay as long as I wanted. I assured him that I would pay for anything I needed and had brought with me sufficient gasoline for the return trip. (The boys who brought me had left for Mitú, but the village had a communal outboard motor.) He showed me to one of the

thatched houses, which was unoccupied, and said I could string up my hammock there. As I unpacked, he told me that it was a quiet time for him. Some of the people had gone off for several months to cut rubber, and only about thirty persons were now living in the village. Besides, it was *puro verano* ("pure summer"); he gestured to the brilliant blue sky and puffy white clouds. That meant an abundance of fish, safe travel on the rivers, and a time of good health. I explained to the chief that I was interested in learning how his people cultivated plants, especially coca, and how they prepared them for use. He said he would be happy to take me to his own fields to show me.

Later in the day I spoke again with the teacher. He told me that coca in the Cubeo language is *patu*. *Patu* was the first Cubeo word I learned. As we talked about life in the village, a distant thumping started up. The *maestro* stopped talking. "Let's go next door," he said. "They're preparing some *patu* now." We walked to the next house, where the sound was coming from. Its source was a tall wooden mortar, about eight inches in diameter and three feet high. The woman of the house was vigorously and rhythmically pounding a large wooden pestle. She spoke a few words to a young girl, who promptly served me a gourd of *chicha*. I was coming to like the tangy drink.

After a few minutes the woman stopped her work and poured the contents of the mortar into a large gourd. What came out was a fine, bright-green powder. She then reached into a pile of fluffy gray ashes near the fire, scooped up a big handful, and added it to the powder, mixing with her hand until the color became a uniform, rich gray-green. Then she stopped as the *maestro* introduced me and explained that I was interested in coca.

"Would you like to try some?" the man of the house asked. I said yes. He took a metal can off the shelf, opened it, and extracted a heaping spoon of the same gray-green powder, offering it to me.

"I don't know how to use it," I said. I had never seen coca prepared this way, although I had read that Amazonian Indians use powdered leaves mixed with ashes, which supply the alkalinity. The man indicated that I should dump the whole spoonful into my mouth. I did so, and in the next instant fell on the floor choking.

¡Cuidado! Es peligroso, the *maestro* exclaimed. ("Careful! It's dangerous.") The powder was so fine that it created a miniature dust storm in my mouth. Inhaling before the dust settled was not advisable, it seemed. After a few difficult minutes, I recovered my ability to breathe and concentrated on masticating the coca powder into a workable mass. From time to time I breathed out green "smoke," but soon all the powder was moistened. I now had a large pasty lump in my mouth that I tucked to one side between cheek and teeth. Once the danger

was over I was able to concentrate on the excellent flavor of this Amazonian coca preparation. It was truly *sabroso,* as I told my hosts—a rich, toasted, green taste, slightly smoky. Within a few minutes I felt a pleasant tingling and numbness spread through my mouth and down my throat. Soon after, I felt a warm, satisfying glow in my stomach. And then, little by little, my mood brightened, and I found myself exchanging warm smiles with the people in the house. They were all delighted that I enjoyed their *patu.*

I maintained the gob of paste in my mouth for about an hour, swallowing the juices that accumulated and occasionally licking off a dab and rolling it around my mouth. One advantage of this preparation is that it all dissolves eventually, leaving nothing behind to spit out. The good feeling it gave me lasted for some time after I had nothing more in my mouth; in fact, it never really ended but simply trailed off imperceptibly. By then the sun was setting, a lovely sight, and soon afterward a magnificently clear, starry sky was overhead.

The days I spent in the Cubeo village were long and placid. Each morning, people went off to tend their fields, the women were forever working yuca into cassava or *chicha,* and, at all hours of day and night, men went off in canoes to fish. The basic diet of the village was river fish grilled over open fires, cassava, and *chicha,* with occasional ears of maize, dry-roasted. Hot chili peppers and limes were available and delicious pineapples as well. The other staple was *pupuña,* a starchy, orange-colored palm fruit that was boiled, mashed, and fermented into another kind of *chicha.* The people looked well fed and in good health, although all of the children appeared to have gastrointestinal parasites. The most distressing environmental hardship was sand flies, which abounded and inflicted very irritating bites.

On the third day of my stay, *el capitán* took me with him in the morning to see his fields. I followed him along a trail through the forest for about half an hour until we came to a huge clearing planted with yuca of all sizes. Pineapples grew haphazardly among the yuca, along with a few pepper plants. I stumbled across giant fallen trees to keep up with the chief as he led me to his coca patch. "*Patu,*" he said, gesturing to the little bushes. There were perhaps fifty plants, all about three feet tall, which looked as if they were being harvested continually. I rubbed some of the glossy green oval leaves between my fingers. "And every household grows its own coca?" I asked. "Yes," the chief replied.

"Have the Cubeos always used coca?"

"Not always," he told me. "The old people say it was brought here

a long time ago, but no one remembers how." He pointed to a large Cecropia tree. "*Yarumo,*" he said.

"What do you use *yarumo* for?" I asked.

"For the ashes," he explained. Cecropias are common denizens of the Amazon forest. They have very large compound leaves with five leaflets arranged like the fingers of a hand.

"That's *yarumo blanco,*" the chief went on, showing me that the undersides of the leaves were silvery white. "It makes the best ashes to mix with coca." I told him I hoped I would have a chance to prepare some coca with him from start to finish. He said we could do that soon.

That afternoon, nearly everyone in the village gathered in the shade of the unfinished school building to drink *chicha,* talk, and smoke the cigarettes I had brought as presents. Before long, several of the young men began playing reed flutes, and soon someone brought out the coca can and took it around, offering some to everyone. Most of the men helped themselves to generous amounts, but the adolescents and women generally declined. I took a spoonful and got it into a workable lump with only a few coughs. The impromptu party continued till sunset, interrupted only by a refreshing swim in the river. Great pots of *chicha* were served up throughout the afternoon, and the coca made another round. *Chicha* is mildly alcoholic, of course, but it does not seem possible to get anywhere near drunk on it. I discovered that it was possible to drink from a gourd of *chicha* without disturbing the lump of coca in my cheek, letting it dissolve at its own rate.

My friend the schoolteacher became quite mellow after a number of gourds of *chicha* and began to tell me how proud the Cubeos were of their heritage as *indígenas,* natives of the Vaupés. Some of the men began dancing while playing their reed flutes, and in the fading light the rhythm of their fast steps and the curious melody put me into a trancelike state. I recalled that the Kogis of northern Colombia use coca to induce meditative states in religious ceremonies.

"Tomorrow we'll go to cut trees." It was the chief speaking to me.

"Cut trees?" I asked.

"To make more fields," he explained. "We'll leave early."

"Early" meant just as the sun was coming up. The men of the village painted their faces with a dark-red pigment and assembled at the house of one family, armed with machetes and axes. Then we all drank *chicha,* fortified ourselves with good doses of coca, and marched off into the forest. By now I had learned how to put the green powder into my mouth without difficulty, and I found myself marching along

in the column of Cubeos, swinging my machete, humming a tune, and feeling increasingly happy. The coca seemed stronger at this hour of the morning. Its warm glow spread from my stomach throughout my body. I felt a subtle vibrational energy in my muscles. My step became light, and there was nothing I wanted to do more than just what I was doing.

After a long, brisk walk we arrived at the area to be cleared and spread out to tackle the trees. The Indians were very protective of me and took great pains to keep me at a distance when a giant tree was about to crash down. We worked for about three hours, until a large section of forest had been cleared of trees and we were all tired, thirsty, and hot. The men explained that in a short while the area would be burned out, then eventually planted with yuca. We walked back to the village, where the women awaited us with *chicha* and cassava, then went to the river to bathe. It had been a good morning's work.

The following day, the chief took me out with one of his young daughters to gather coca from his fields. We picked leaves from each plant, being careful not to remove the topmost. It took us about an hour to fill a large basket. The sun was so hot that I was glad when we finished our harvesting and started back. On the way, we paused to collect a bunch of Cecropia leaves to burn to ashes.

Back at the chief's house, the basket stuffed full of coca leaves was emptied into a large earthenware cooking pan, about four feet in diameter and eight inches deep. Made of baked river mud, it was usually used for cooking cassava. The chief's wife placed the pan over an open fire, adding more wood to build up a good heat. Then, using her hands and a large paddle woven of reeds, she kept the leaves in constant motion, tossing and rolling them so that they would toast uniformly. She did this for about half an hour until the leaves were crisp and dry, retaining their bright-green color.

I put some of the toasted leaves in a plastic bag to take back to Bogotá. The rest were placed in one of the tall wooden mortars I had seen in use on the day of my arrival, and the chief and I and an old man who joined us took turns pounding them into powder. Meanwhile, the Cecropia leaves were placed over the fire to burn. When the coca had been reduced to a brilliant-green powder, the chief examined some for fineness and then added ashes until the color darkened to his satisfaction. He next placed this mixture into a fine muslin sack and shook it vigorously inside a can; only the finest dust sifted through. When the flow of dust through the sack began to ebb, he poured the remaining powder back in the mortar—it was now

bright-green again—added more ashes, and resumed pounding. We repeated this operation five times, helping ourselves to the finished product to make the work go faster. At the end of the fifth sifting, all that was left in the sack was some fiber; the can was full of gray-green *patu,* just the same as that in every household in the village. The experience of working with coca in this long and natural way, starting from the living plant, intensified my appreciation of the prepared material.

During the time that I lived with the Cubeos I saw coca used only at the start of communal work parties and at fiestas, when it was consumed in moderation, mainly by men, always accompanied by *chicha* and music. Although every house had a supply of prepared coca, I saw no one dip into the supplies except in the company of others for purposes of work or recreation. Young people rarely used it. I took coca almost every day and each time found it tasty and pleasantly stimulating. I developed no craving for it, no desire to increase the dose, and no sense of becoming tolerant to the effect. I saw no evidence among these Indians that coca use was addictive, dependence-producing, or injurious to health. Some old men in the tribe had used coca all their lives and still were satisfied with the occasional consumption of ordinary-size doses.

When I finally left the village to go back to Mitú and then to Bogotá, I carried with me my can of powder and bag of toasted leaves. I was eager to tell people about the virtues I sensed in this plant and to explore its possible uses in modern medicine.

III White Stuff

> Cocaine is for horses, not for men;
> They tell me it will kill me, but they won't say when.
> Cocaine—run all 'round my brain.
>
> —Old song lyric

In 1860, Nieman, of Göttingen, Germany isolated cocaine from coca leaves. Twenty-four years later, Carl Koller, a friend of Sigmund Freud, recognized its local anesthetic properties. Although these discoveries were major breakthroughs in modern pharmacology and medicine, the appearance of cocaine in the world had unfortunate repercussions that echo down to the present day. As Richard Martin writes in his excellent paper "The Role of Coca in the History, Reli-

gion, and Medicine of South American Indians," *Economic Botany* 24 (1970): 422-423:*

> . . . the discovery of cocaine had another less beneficial effect on the reputation of the coca plant; for the occasional abuse of this alkaloid, particularly among persons already addicted to opiates, which was sensationalized by the press both in Europe and the United States at the end of the 19th Century, created the erroneous fear that coca equalled opium in its perniciousness and its deleterious effect on physical and mental health. In the space of 20 or 30 years, coca went from high praise by kings, popes, artists and doctors as the most beneficial stimulant tonic known to man to vigorous condemnation as a dangerous addictive narcotic. The effect of this prejudice and the subsequent legal ban on coca leaves in Europe and the United States was to halt experimentation with and use of coca leaves by doctors; only specialized uses of cocaine in anesthesia were regarded as acceptable. Even more serious, however, is the fact that confusion about the effects of crude coca leaves and those of cocaine has caused many people to regard the chewing of coca leaves as practiced by the Indians of South America as merely an addictive vice, with the lamentable result that coca is now being suppressed even in areas where the Indians have relied on its stimulating and medicinal properties for thousands of years, and where it has formed a significant part of their religious and cultural heritage.

Under United States law, cocaine is classified as a narcotic along with opium and its derivatives. There is no medical justification for this classification. Narcotics are drugs that induce stupor; cocaine is a stimulant. Moreover, regular use of cocaine does not lead to one of the classic phenomena of narcotic addiction: a withdrawal syndrome upon the sudden discontinuance of use. For this reason, pharmacologists say that cocaine does not cause physical dependence. Nor is there any hard evidence that cocaine causes general physical damage to the body, although it has been accused over the years of harming the nervous system in all sorts of ways.

In one person who was shooting cocaine in Colombia I saw a tendency toward verbally aggressive and hostile behavior during the acute effect of the drug. Some snorters experience anxiety reactions to high doses. But I have never seen cocaine produce real aggression, violence, or psychosis. Among the hundreds of cocaine users I have known, I have only seen the drug induce good moods; typical users enjoy talking and listening to music while high.

It would appear that many of the beliefs about cocaine that have led to current law-enforcement practices are unfounded and have their origin in the hysterical fears of past days when cocaine was judged guilty by association, particularly with opiate addicts. For example,

* See pp. 20–37.—Eds.

in sustaining unusually harsh sentences for two young men convicted of distributing small amounts of cocaine, a federal judge in Massachusetts last month justified his action by citing this paragraph from the 1970 Working Papers of the National Commission on Reform of the Federal Criminal Laws (p. 1085):

> Cocaine is a powerful stimulant. While it does not cause physical dependence, a very strong psychological dependence upon cocaine can be developed. In the United States it is usually taken by heroin addicts in combination with heroin—as a "speedball," but occasionally people take it alone. It is not more often used alone because it may produce acute anxiety and may precipitate psychotic episodes. . . .
>
> It should be classified as a dangerous drug because it may precipitate acute anxiety and psychotic episodes, and there is a strong possibility that such episodes may involve aggressive or violent behavior.

These ideas are terribly inaccurate. As I wrote earlier, the vast majority of American cocaine users take the drug rarely or occasionally, only by the nasal route, and in highly diluted form. They do not also use opiates and do not become aggressive, violent, or psychotic. Presumably, as more and more middle-class, "respectable" citizens try cocaine, the old attitudes will slowly change.

In defending cocaine against the attacks of misinformed people, I do not mean to suggest that the drug is innocuous or beneficial. I see two main problems with it.

The first is simply that cocaine does not miraculously bestow energy on the body; it merely releases energy already stored chemically in certain parts of the nervous system. Consequently, when the immediate effect of the drug wears off, one feels "down"—less energetic than normal. The down following the high of cocaine is very noticeable and discourages some people from using the drug more than a few times. "I really like the way I feel after I snort it," one user told me, "but I can't handle the feeling two hours later."

This pattern in the effects of cocaine makes it a perfect object for the behavior of dependent persons because the simplest way to get out of the down phase is to take another snort. In the U.S., cocaine is too expensive for most people to use with any regularity, but whenever I have been around people who have large amounts of cocaine available to them, I have seen how easy it is to get into using it all the time. Once, in Ecuador, I stayed briefly with a group of Americans who used a lot of a crude form of cocaine known as "base," which is the free alkaloid. Cocaine base is an amorphous solid, tan or brown in color, that is smoked (usually with marijuana in South America). In the illicit trade it is the next-to-last step in the manufacturing process.

When reacted with hydrochloric acid, the base forms a crystalline hydrochloride salt, which is the usual commercial form. When I smoked cocaine base I found it powerfully stimulating, but the depressant phase was even more powerful. I commented on that to my hosts, and one woman replied, "Yes, it certainly has a hook in it, doesn't it." She then lit another pipe.

The second problem with cocaine appears when one bites the hook and uses more of the drug to relieve the depression. Tolerance to cocaine develops very rapidly, so that a second dose gives a less intense high that lasts less time. Users who have access to large amounts of cocaine can find themselves, very quickly, using it all the time and not doing much else. I saw a number of Americans in Colombia who spent most of their waking hours in unfurnished rooms snorting coke to the exclusion of most other activities. But I must repeat that this pattern seldom occurs in the U.S., where cocaine is so expensive and so highly adulterated.

Besides these two pharmacological problems of poststimulatory depression and rapid tolerance, there are several other drawbacks to cocaine. For one thing, it is irritating to the membranes of the upper respiratory tract. On two occasions, within twelve hours of snorting moderate doses of cocaine, I have come down with colds that began as sore throats, probably triggered by the irritation. Possibly, some of this effect is due to adulterants or contaminants of black-market cocaine. (More than once I have come across samples of Colombian coke that reeked of hydrochloric acid; doubtless, the crystals were rushed into packages without proper washing.) But cocaine on its own powerfully constricts small blood vessels in the nasal membranes. For this reason it clears the nasal passages. But over a long time, snorting cocaine certainly leads to weakening of local tissue by interference with blood supply.

Furthermore, I do not believe we are meant to put powerful drugs into our systems by the nasal route. When cocaine is snuffed, it rapidly and directly enters the bloodstream. The rush of stimulation that some users like is largely due to the rapid increase of concentration of drug in the blood that follows this method of administration. Snorting is only one step down from intravenous injection. Like shooting, it bypasses many of the mechanisms our bodies have for protecting us from the adverse effects of foreign substances. When we put a drug in our stomach, we allow the body to decide how fast to admit it to the bloodstream and give the liver and kidneys time to work at metabolizing and eliminating it.

It is hard to convince people who like cocaine that they would be better off eating the drug than snorting it. Taken by mouth, cocaine is

less potent; that is, one needs a bigger dose. Therefore, eating cocaine is economically unfeasible for most users. Also, oral cocaine does not provide as strong a rush. But neither does it cause the same degree of poststimulatory depression or tolerance of such rapid development.

I must cite a final and troublesome problem of cocaine: the difficulty of leaving it alone. It is terribly hard for people who like the stimulation of cocaine to let the drug sit around unused. The white powder seems to exert a strong attraction even if it is kept out of sight.

Earlier I have examined an analogy between refined white sugar and heroin. I stated my belief that the refining of natural substances into white powders is dangerous because the powders are hard to control. Use of opium can be stabilized and regulated much more easily than use of heroin. People who have only raw sugar available eat far less sugar than people who use the white stuff. In both cases it seems that the more natural form carries certain messages that dictate appropriate use. These messages may be carried by the associate substances that occur in the plants. Raw sugar has many things in it besides sucrose, the sweet essence, and these other things convey strange tastes that keep us from consuming more than our body wants. When the other things are left behind in molasses, we lose those signals and are able to consume sucrose in huge amounts, possibly to the detriment of our health. In the same way, opium contains many compounds other than morphine, its active essence, and it is likely that these associate substances provide a kind of pharmacological insulation that protects users from the naked, hard-to-control effects of morphine.

It should come as no surprise to learn that cocaine is but one of many physiologically active chemicals in the coca leaf. To date, some fourteen alkaloids have been isolated from varieties of the plant. Pharmacologists have burdened us with the notion that drug plants must owe their properties to a single "active principle" that can be isolated, synthesized, studied, and administered in pure form. This notion may be helpful to pharmacologists in making their experiments simpler, but it is disastrous to the rest of us because it leads us away from natural green medicines in the direction of white powders with far higher potentials for abuse.

Martin states the problem well:

> . . . the effects of the coca leaf often have been presumed to be embodied in the alkaloid cocaine, albeit in a more potent form, with the result that the majority of the physiological research for the last 50 years has been performed solely with cocaine and not with other preparations of coca leaves. However, many physicians have emphasized that the effects of these two are not identical, and particularly that the therapeutic qualities of coca are not represented completely in the active principle cocaine. An important consideration in this

regard is that active principles and particularly alkaloids can exert quite different effects when administered as they are naturally combined in the plant than when administered singly in pure form. Very little is known about the physiological activity of the associate alkaloids of the coca plant, and still less about their effects in combination. The necessity of looking into the possible importance of these other compounds is emphasized by the fact that an Indian will frequently reject the bitter coca leaves with the highest percentage of cocaine in favor of the sweeter leaves which are richer in the more aromatic alkaloids.

Cocaine today has very little use in medicine. Doctors sometimes use it as a topical anesthetic in the eye, nose, and mouth. For local anesthesia by injection, it has been replaced by a number of synthetic "-caine" drugs that have no effects on consciousness. In isolating cocaine from coca and equating the effects of the leaf and alkaloid, European and American scientists not only gave the world a troublesome and not very useful chemical, but also deprived themselves of the benefits of a most useful plant. In so doing they dishonored the spirit of Mama Coca, and the sad results may well be her retribution.

IV The Honor That Is Due Her

According to Indian tradition, coca was a gift from heaven to better the lives of people on earth. Over the years South American Indians have found the leaf beneficial in numerous ways. Aside from its ability to clear the mind, elevate mood, and make energy available, it appears to exert good influences on many physical functions. For example, it tones and strengthens the entire digestive tract, probably enhancing the assimilation of foods. A hot-water infusion of coca sweetened with a little raw sugar (called *agua de coca*) is an excellent remedy for indigestion and stomach-ache that was widely used even by non-Indians throughout South America until relatively recently.

Coca appears to maintain the teeth and gums in a good state of health; it keeps teeth white. The leaf is rich in vitamins, particularly thiamine, riboflavin, and C. An average daily dose of coca leaves (two ounces) supplies an Indian of the high sierra with much of his daily vitamin requirement. Coca appears to have a beneficial influence on respiration, and is said to effect rapid cures of altitude sickness. It also rids the blood of toxic metabolites, especially uric acid. Indians say that regular use of coca promotes longevity as well.

When European doctors carried coca back to their continent, they were able to confirm many of the therapeutic powers attributed to it,

and prescribed it widely to patients. Proprietary tonics based on coca became extremely popular. Our own Coca-Cola is an emasculated descendant of one of these nineteenth-century preparations.

My personal experiences with coca leave me convinced that the leaf is pleasant to consume and moderately stimulating in a useful way. It does not appear to be associated with dependent behavior or to provoke development of tolerance. It can be left alone if one chooses.

By contrast, cocaine is much less pleasant to consume, easily becomes associated with dependent behavior, is not very useful, and is very hard to leave alone. Yet in our society a great many people are using cocaine, and hardly anyone has seen a coca leaf. How have we managed to create such a situation?

Drug abuse is much more than the use of illegal and disapproved drugs by some members of society. It is the whole mentality that leads a society to make available to its citizens worse drugs rather than better ones, and many of us contribute to that mentality. The pharmacologist who teaches that coca and cocaine are equivalent, the physician who esteems synthetic white powders above natural green preparations and the judge who believes that cocaine is used mainly in combination with heroin are all as much responsible for unwise use of drugs as the user who takes cocaine in excess.

Throughout all of the argument as to why people use illegal drugs, we sometimes fail to notice the obvious: that people tend to use whatever is available. Over the past eighty years, everything we have done as a society to "protect" people from potentially harmful drugs has served to make worse preparations more and more available. The situation with cocaine is a paradigm of the process.

If a demand for a drug exists, it will be supplied. The demand for cocaine in our country is high, and black-market traffic in it will grow. There is no chance of curtailing the use of cocaine by trying to cut off the flow of it or by punishing users and sellers. But there might be a chance of trying to interest users in coca and thereby encouraging them to shift their attention to something distinctly better.

On returning from the Amazon, I shared my coca with a number of cocaine users. All of them liked it and some said they would like to use it instead of cocaine. Of course, I told them a lot about the leaves in advance so that they chewed them with a good set. Set and setting are especially important in shaping reactions to natural drugs like coca.

Ignorance about coca is widespread. Not only have few cocaine users ever seen a coca leaf, many of them do not even know that coca exists. Some people who have heard of coca confuse it with cacao, the source

of chocolate and cocoa. I have met almost no American physicians who are knowledgeable about coca.

I have often written that mental states triggered by drugs are latent in our own nervous systems and may be elicited by a variety of non-pharmacological methods. But I do not think it is reasonable to expect most people to be able to do without pharmacological aids. The use of drugs in our country is very great, and many of the legal ones, such as alcohol, tobacco, coffee, and tranquilizers, cause more social and medical trouble than some of the illegal ones. It is unrealistic to think we can make drugs go away. But we can teach people how to use them in better ways. One step in that kind of education would be to explain that natural drugs are less of a problem than isolated active principles and that certain natural drugs, like coca, are beneficial if used occasionally and with respect for their power.

The Indians I know who use coca respect their drug. They honor Mama Coca by treating her plant reverently, preparing it for use carefully, and guarding its power by saving it for occasions when they need it. The essence of drug abuse is nothing more than failure to honor the wisdom and power of Nature, which has provided us with remedies of great efficacy to sustain us through the toils of day-to-day existence.

In collecting information for these letters, I received needed help from the following persons:

Dr. Jesús M. Idrobo of the Instituto de Ciencias Naturales of the Universidad Nacional, Bogotá, Colombia;

Msgr. Bermino Correa Yepes of the Prefectura Apostólica, Mitú, Colombia; and

Dr. Richard Evans Schultes of the Harvard Botanical Museum, Cambridge, Massachusetts.

The Gourmet Coke Book

The Gourmet Coke Book *was published by the White Mountain Press in 1972. Although its authors have chosen to remain anonymous, their findings on current cocaine use are accurate and perceptive.*

COCAINE USE AND CONTROL

THERE are several methods used by cocaine consumers to achieve their high. Probably the most prevalent of these is snorting. Snorting cocaine is popular due to the immediate high and the fact that there are fewer risks than shooting it. Shooting is popular with some due to the intense initial rush. It is, nonetheless, much more dangerous than the snorting method, since the drug is being introduced directly into the blood stream and consequently many variables are involved, *e.g.*, purity of the drug, sterility of the syringe, nature of the cut, and unknown miscellaneous physical responses.

Cocaine can also be taken orally by either mixing it with a liquid or semisolid, *e.g.*, custard, or by direct application on the gums, palate, and underneath the tongue. A lesser known and hazardous method is to apply the drug to the inside of the eyelid. Owing to the anesthetic nature of cocaine, it is sometimes applied to the genitals to prevent premature ejaculation. Cocaine enemas are also used by rectal enthusiasts as well as by hemorrhoid sufferers. Since snorting cocaine encompasses approximately ninety per cent of the preferred method by its users, we will be referring to this method unless otherwise specified.

"Doing" cocaine is still mysterious; the results of prolonged use are inconclusive. Many different interpretations of the effects of cocaine are merely individual appraisal. There are, nonetheless, several gener-

ally acknowledged hazards in using cocaine that can be lessened by adhering to certain controls.

Perhaps the most important thing for the cocaine snorter to know is how to care for his nose, which is abused by the harshness of the drug.

The interior of the nose is lined with mucous membrane, a sensitive tissue, and small hair follicles. When the cocaine is snorted, much of it goes through the nasal passages and down the throat. During the time the cocaine is moving through the passages, bits of it are being taken in by small capillaries within the mucous membrane that carry and spread the drug throughout the body and to the brain. At times, however, some of the drug can become lodged among the hairs in the nose. The cocaine that remains within the nose for any length of time irritates the membrane and can cause sores and bleeding. Small amounts of the drug can also become lodged in the sinus cavities, which can result in congestion and related discomforts. In order to prevent such problems there are numerous procedures that, when followed, aid in maintaining clear and unirritated nasal passages. The first is to keep cocaine finely grained. The user achieves this by chopping the drug with a razor blade until it is level and uniformly fine. A mortar and pestle is also used to grind the powder. The finer the grain, the smaller the possibility of getting some of the substance lodged in the nose or sinuses. A bit of water snorted into the nose will usually help dislodge and dissolve any pieces that may be held by the cilia. Occasional use of nose drops and nasal sprays help preserve the delicate nasal membranes. Finally, rinsing the nasal cavities with warm water after snorting also assists in soothing the nasal linings.

If all of these procedures are followed and a user's nose is still irritated and bothering him, this probably means that he is snorting too much.

An individual who "shoots" cocaine into his body is more apt to become heavily dependent upon the drug than one who does not. When injected, the drug becomes absorbed into the individual's blood stream very rapidly, so that the user experiences a sudden and total exhilarating rush. This rapid absorption into the body shortens the duration of the high. In addition, it creates within the user a desire to experience again the initial rush, which can only be obtained by the actual shooting. A heavy coke-head may shoot up to twenty or thirty times a day if he can afford to. Therefore, one who subjects himself to the actual injection of the drug is taking a risk each time he does so, owing to the numerous dangers that shooting entails. The user who injects cocaine must be aware of the type of

cut, the amount of the cut, his metabolic rate, his blood pressure, the sterility of the syringe and the condition and sterility of any additional paraphernalia he may require. In addition, of vital importance is the act of injecting the drug into one's body in such a manner as to avoid the development of an air bubble within the vein, or a break within the vein itself.

The user who directly applies cocaine upon the oral surfaces of the gums, palate, lips, or tongue must be careful in order to prevent coarse granules of the drug from becoming lodged within these areas, thereby forming sores, bleeding, and discomfort.

Everyday use of cocaine normally leads to depression when not high. This depression is usually referred to as "being coked out," and this condition can precipitate a psychological dependence upon the drug. It has been reported, however, that if the drug is used in moderation, and the nose is not abused, then, under normal circumstances, there is no hangover period and the moderate user can function the next day without the "cocaine blues."

The consumer is additionally faced with the dilemma of discerning the actual amount of cocaine he is using or purchasing. Most sophisticated consumers of the drug are aware that a spoon of cocaine is not always, and, as a matter of fact, seldom all cocaine. In addition, an ounce of purchased cocaine might weigh an ounce on a scale, whereas the actual cocaine content is decidedly less. These discrepancies result from the fact that cocaine is usually cut and, although most users are aware of this, few are able to actually analyze the nature or amount of the cut.

Cocaine is perhaps one of the trickiest drugs to analyze and, in the absence of the chemist, cocaine analysis becomes more an art than a science. As in all arts, practice and experience are the only ways to further one's ability to analyze the drug. This guide will attempt to relate the procedures ordinarily followed in cocaine analysis.

The two factors of utmost importance to the user are the purity of the cocaine and the content of the "cut." It is at this point that most users ask the questions: "How much is it cut?" and "What is it cut with?" These are two fairly simple questions, yet arriving at the answers could be a very complicated task. To answer these questions properly, the consumer must be able to test the product he purchases. There are numerous steps one must go through for testing the cocaine.

Pure cocaine crystals have an opalescent (shiny, almost transparent) appearance. When the crystals are crushed, they still retain a slightly crystalline sparkle. People can be fooled by cocaine that is sold as pure because of its rock form. This is not valid, because cocaine can

be cut and then reconstituted into rock. If, however, the rock is broken open and crystal layers are found within, the chances of purity are greatly improved. When combined with most cuts the cocaine crystals will become duller. The amount of sparkle is determined by the increase of the cut. Some cuts, however, dull the sparkle more than others. Dextrose is less dulling than lactose. A "speed" (amphetamine) cut usually dulls the cocaine crystals less than most other cuts. Although salts also have a crystalline structure, these also tend to be duller than the cocaine crystals. Cocaine has a bitter, medicinal taste and the addition of a cut will alter that taste. A dextrose cut will sweeten the cocaine. Lactose, another sugar, is less sweet. Procaine, like cocaine, will be bitter, but it will numb the gums or tongue quicker than cocaine and the numbness will last longer. Salt has an aftertaste and epsom salts are a bit more sour in taste and sandy in texture.

Slowly burning a small amount of cocaine can indicate several cuts. Aluminum foil is usually used when burning the drug. A small bit of cocaine is placed upon a square of foil and held over a low flame or match. Pharmaceutical cocaine burns clear. A sugar cut will darken the burn to dark brown or black. The larger the cut, the darker the burn. Refined cocaine burns a reddish brown with little residue. A sugar cut here will blacken the burn. Crystallized speed will pop when burned. Salts do not burn and remain as residue. Some cuts, such as menita, procaine, and quinine, burn fairly purely. Procaine can be detected by a bubbling of the substance before it burns clear.

Snorting, perhaps the most important test, will indicate the actual potency of the cocaine. If the tester standardizes the amounts snorted, he will develop an ability to distinguish among the subtleties of the "head." Timing the swiftness of the high and of the "freeze," or numbness, is an important consideration. The strictest rule that the tester adheres to is to be sure he is straight when embarking upon this test. If the snort burns the nasal passages and makes the eyes tear, the probability that the cocaine had been cut with speed would be a good educated guess. Sugar and salt cuts will at times cause a postnasal drip. The extent of this drip can be controlled by the skill of the cutter.

A more sophisticated test is the methanol test. Methanol is used because most common cuts do not dissolve in pure alcohol, while cocaine and, unfortunately, procaine and speed do. Pure methanol must be used in this test because the presence of water in any alcohol will also dissolve the sugars and salts. One hundred per cent methanol is often obtained in paint supply stores as methylated spirits.

When testing with methanol, two small, equal amounts of the substance to be tested are placed in two teaspoons next to one another.

One quarter of a teaspoon of pure methanol is added to one of the teaspoons. This mixture is then stirred with a toothpick. Any powder that remains is definitely the cut. The amount of the cut is then compared with the original, unaltered amount in the second teaspoon to determine the percentage of the cut. If, for example, twenty per cent of the original amount did not dissolve, the substance tested could be no more than eighty per cent pure. This is not to say that all the material dissolved was cocaine; some of it could have been procaine or the other cuts that also dissolve in methanol.

If procaine is the suspected cut, it can be extracted from cocaine by adding the cocaine to a light petroleum in a sodium bicarbonate solution. This would dissolve the cocaine, so that all that remains would be the procaine.

There are additional indications of identifying cocaine cuts. Excessive sweating and hyperactivity could mean either a speed or quinine cut. Excessive diarrhea could denote a laxative type cut such as epsom salts or menita. Speed is also known to cause irregular bowel movements. Lengthy numbness could designate the presence of procaine or other local anesthetics such as lignocaine, orthocaine, and benzocaine. These are, however, difficult to obtain and therefore seldom used. In addition, volume differentiation is a fairly accurate method of assaying the approximate percentage of pure cocaine. The cobalt test, which is commercially marketed in head shops, is also readily accessible to those who wish to test for purity content. This test is based on the intensity of the blue color of the cocaine-cobalt mixture.

By using one, a combination, or all of the above, the consumer would be able to get a close estimate of the answers to those two important questions: "How much is it cut?" and "What is it cut with?"

THE EFFECTS OF COCAINE

Anyone who uses cocaine would describe its spell in almost the same words. Powerful is perhaps the most encompassing term for the total effect of the drug. Several top salesmen have attributed their number-one ranking in sales directly to the drive instilled in them by cocaine.

By virtue of its seductive nature, cocaine stands out prominently from all other habitual drugs. It has the power to relieve body fatigue and promote physical activity and energy. It is equally efficient in dispelling depression of spirits and promoting mental activity and

cheerfulness. These varied effects have made the drug an extremely desirous commodity for people "on the go."

In spite of these seemingly positive effects, historically cocaine has been linked with negative repercussions. The "dope fiend" of Victorian England was reportedly a cocaine addict. American users of the drug have been described as belonging to society's unsavory element, which included gangsters, prostitutes, and degenerates. In spite of this bad press, cocaine began attracting a more socially accepted constituency. As this following grew, the cocaine culture came into existence. How did something considered so negative for so many years and legally regarded as one of the most dangerous drugs maintain its allure? This enigma might best be solved by directly contrasting the pleasure of cocaine against the dangers of the drug to determine which effects, if any, retain a stronger influence over those who indulge.

Cocaine stimulates the central nervous system, yet the effects are difficult to interpret. This difficulty lies in the subtlety of the high. How can a drug that affects the central nervous system be subtle? Here lies the mystery of cocaine. It is the result of a unique combination of sensations. Cocaine stimulates the spinal cord, medulla, brain, and muscular coats of the circulatory system. Its anesthetic properties numb the sensory and motor nerve endings. When applied to the mucous membrane, the blood vessels contract, resulting in decreased sensation. As a stimulant, it heightens sensations and as a local anesthetic, it numbs them. Owing to the interaction of both sensations, there is a resulting "high" of flowing subtlety.

This high is considered the perfect cocaine "head." Unfortunately, this head changes with continuous or excessive use.

The cocaine habit is a real and disturbing problem. Although not physically addictive, the nature of the drug causes a progressive increase in usage. The high is said to induce psychic dependence without building up a physical tolerance for the drug. This psychic dependence is directly related to feelings of satisfaction that require periodic administration of the drug to produce pleasure. There are varied characteristics that can cause excessive administration of the drug. One can only presume what these factors may be by examining the statements and behavior of the individual affected. This is further influenced by his honesty, frankness, and general psychological state. The prevailing social outlook is an additional feature of importance here.

An occasional user of cocaine may experience the symptoms of mental excitement, talkativeness, heightened reflexes, numbness in the nose and throat, dilated pupils, possibly a buzzing in the ears, and increased sexual stimulation. These responses vary in intensity and

duration depending upon the purity and content of the cocaine. If a person indulges excessively, a metamorphosis occurs. The pleasurable effects may turn to pallor, cold perspiration, aggressiveness, anxiety, insomnia, headaches, reddened, irritated nostrils or nosebleeds (if snorting), and feelings of heaviness throughout the limbs. If one does not heed these warning signs, cocaine poisoning may set in, thereby increasing the possibilities of an overdose. The amount of cocaine that may result in an overdose varies slightly from individual to individual. It has nonetheless been disclosed that a fatal dose of cocaine may range from 20 milligrams to 1.2 grams of pure cocaine. The symptoms of an overdose include convulsions, fainting, and a halt in respiration. Should this situation arise, the approved methods of treatment, until medical assistance is made available, include:

(1) Washing stomach with one pint water to sixty (60) grams sodium bicarbonate solution
(2) Inhalation of ammonia
(3) Inhalation of oxygen and five per cent carbon dioxide
(4) Cardiac massage
(5) Artificial respiration

Abrupt withdrawal from cocaine is the best method to combat its habitual use, since the withdrawal symptoms are less severe than breaking a caffeine habit. The telltale signs of excessive cocaine use are very acute and easily recognizable. Each individual who indulges has his own particular threshold. When this threshold is reached, it's time to listen to your body's complaints.

EDWARD M. BRECHER
and the Editors of *Consumer Reports*

The Consumers Union Report on Coca Leaf and Cocaine

For nearly four decades the Consumers Union has focused an accurate and unbiased searchlight on consumer goods and services. Their Reports, concise and devoid of specialist jargon, have become world famous for their objectivity.

Notwithstanding the current spate of books on the subject, Licit and Illicit Drugs *(1972) stands out as one of the most comprehensive, creative, and provocative volumes yet to appear. We have chosen those four chapters from it that deal with coca and cocaine, as well as other material from the book that places their observations on those substances in a social perspective.*

In particular, the Report observes that such socially accepted indulgences as alcohol, nicotine, and caffeine, despite their image as "non-drugs" and their legality, are *drugs, and are, moreover, dangerous drugs that can and do poison and addict millions who use them to excess. The Report points out that they either cause or contribute to countless premature deaths from such scourges as cancer, diseases of the heart, liver, and respiratory system, and alcoholism. It underscores the gross social hypocrisy of not considering such substances as "hard" drugs by contrasting their mass public ravages with the highly sensationalized yet* relatively *minor personal and social damage attendant to those popular scapeboat villains, LSD, cannabis, cocaine, opiates, and amphetamines. Using caffeine as a model, the Report states:*

"When we examine the behavioral effects of large doses of caffeine in animal experimentation . . . shocking findings must be noted. . . . Rats fed massive doses of caffeine become aggressive and launch physical attacks against other rats. . . . A caffeine-crazed rat may bite and mutilate himself. Automutilation was so acute and intense in some rats that the animals died from hemorrhagic shock.

"Some readers may here be moved to protest that the bizarre be-

havior of rats . . . is irrelevant to the problems of human coffee drinkers. . . . There is a lesson to be learned, nevertheless, from these rat reports. If the drug producing these effects in rats were marijuana, or LSD, or amphetamine, the report would no doubt have made headlines throughout the country. One of the distorting effects of categorizing drugs as 'good,' 'bad,' and 'nondrugs' is to protect the 'nondrugs' such as caffeine from warranted criticism while subjecting the illicit drugs to widely publicized attacks—regardless of the relevance of the data to the human condition.

"Thus we come to the paradox—the question of how a drug so fraught with potential hazard can be consumed in the United States at the rate of more than a hundred billion doses a year . . . without doing intolerable damage—and without arousing the kind of hostility, legal repression, and social condemnation aroused by the illicit drugs.

"The answer is quite simple. Coffee, tea, cocoa, and the cola drinks have been domesticated. *Caffeine has been incorporated into our way of life in a manner that minimizes (though it does not altogether eliminate) the hazards inherent in caffeine use. Instead of its being classified as an illicit drug, thereby grossly amplifying caffeine's potential for harm, ways to make caffeine safer have been searched for and found. . . . People generally take caffeine in forms so diluted as to make it highly unlikely that excessive doses—more than 300 or 400 milligrams at a sitting—will be ingested. The contrast here with alcohol is noteworthy. Whiskey, gin, and other distilled beverages, in contrast to light wines and beer, increase the likelihood that excessive amounts of alcohol will be ingested. . . . Coffee is customarily served with cream or milk, which may at least partially protect the lining of the stomach. . . .*

"By keeping coffee legal, society has avoided extortionate black-market prices that might otherwise bankrupt coffee drinkers and lead them into lives of crime. And coffee drinkers are not stigmatized as criminals, driven into a deviant subculture with all that criminalization entails.

"That other drugs now deemed illicit might be similarly domesticated with a similar reduction in the damage they wreak on individuals and on society, is a possibility readers may wish to keep in mind. . . .

"It is clear . . . that the amounts of those drugs [LSD, heroin, illicit barbiturates, illicit amphetamines, and so on] used is trivial compared with the amounts of caffeine, nicotine, alcohol, and marijuana used. One conclusion is thus inescapable: the United States has been focusing an overwhelming proportion of its anxiety and concern on a very small corner of the drug scene.

"Another obvious inference to be drawn from the above . . . is that we Americans—like almost all other human cultures, ancient and modern, primitive and civilized—are a drug-using people. Indeed, Homo sapiens *is a drug-using species, and has been for thousands of years.*

"A third obvious inference is the relative rarity of non-drug-users in our culture. No estimate has been made of the number of American adults who have never *used a mind-affecting drug, including caffeine, nicotine, and alcohol—but the number must be very small, a few percent of the population at most. The nonuse of mind-affecting drugs, indeed, can be described as aberrant behavior, deviating from the norms of American society.*

"Caffeine, nicotine, and alcohol were universally recognized as drugs during the nineteenth century, and were denounced as such. Their treatment as nondrugs today protects them from prohibitionist proposals and other repressive measures; it also enables coffee, tea, and alcohol drinkers, along with cigarette smokers, to decry the widespread use of 'drugs.'"

COCA LEAVES

When the Spanish *conquistadores,* early in the sixteenth century, first encountered the empire of the Incas,* they found that the Emperor himself—the Inca—controlled the use of a remarkable drug contained in the leaves of a mountain shrub now known as *Erythroxylon coca.* When these leaves where chewed, euphoria and other desirable effects soon followed. "Among the highest rewards the Inca could give," Dr. Hector P. Blejer explained in the *Canadian Medical Association Journal* for September 25, 1965, "was the right to chew the coca leaf, which was prized far above the richest presents of silver or gold." [1] Priests and supplicants were allowed to approach the Altar of the Inca only if they had coca leaf in their mouths. "Even at the moment of death it was, and still is, believed by the natives that, if the moribund person was able to perceive the taste of the coca leaves pressed against his mouth, his soul would go to paradise." [2] A plentiful supply of the divine drug was buried with each Inca nobleman.

The *conquistadores* took over the Inca's coca leaves along with his

* The portion of South America that today comprises Peru, Bolivia, Ecuador, and parts of Chile and Colombia.

empire. Although superstitiously afraid to use the drug themselves, they "gave coca freely to the Indians to control them, and hold them more tightly as virtual slaves. Under the effects of the coca leaf the Indians worked harder, longer, and with less food [coca, like amphetamine, is a potent appetite suppressant]. . . . It also helped them, perhaps, to endure, and forget, and even escape their misery." [3]

The Spaniards supported their empire by taxing the Indians heavily; "ironically, some of these taxes had to be paid in coca leaves, a commodity in which the administration had a very profitable turnover." [4]

Meanwhile, high in the Andes Mountains, where the coca shrub has been cultivated since time immemorial, natives beyond the reach of the Spanish occupation continued to chew coca leaves, as no doubt they had chewed them before the days of the Incas, and as they continue to chew them today. Far from suffering disaster, they have managed through the centuries to survive the rigors of an incredibly harsh mountain environment, to the continuing amazement of European visitors. Nor do the Andean leaf-chewers appear to become addicted; on moving down to ordinary altitudes, many of them give up their coca without apparent hardship.†

Nineteenth-century European and American scientists, naturally enough, took an interest in this potent drug. "All trustworthy travelers agree," an American physician, Dr. J. L. Corning, wrote in 1886, "that the most noticeable effect . . . consists in a marvelous invigoration of the strength, both mental and physical. The native is enabled to undertake the most difficult and prolonged marches with little other sustenance." A large dose, however, Dr. Corning added, "produces a species of intoxication, accompanied by sensations of lively satisfaction as well as hallucinations of various kinds." [6]

The chewing of coca leaves, for some unknown reason, never became popular either in Europe or North America. Various drinks made from the coca leaf, however, were introduced into Europe—notably "Mariani's wine," a red wine or elixir containing coca, manufactured during the nineteenth century by a Corsican, Signor Angelo Mariani. "Among his clients," Dr. Blejer notes, "were Gounod, Massenet, and Pope Leo XIII, who for years was supported in his ascetic retirement by Mariani's product." [7] Just as caffeine helped pious Mo-

† Dr. Jerome H. Jaffe wrote (1965): "It is reported that two million Peruvians who live in the Andean highlands, or 90 percent of the adult male population, consume . . . cocaine . . . in the form of coca leaves. In view of the fact that many of these highlanders, who have chewed coca leaves for years, abandon the practice when transferred to a lower altitude, it does not seem appropriate to call this use of cocaine an addiction." [5]

hammedans stay awake during prolonged religious rituals, so coca helped Christian ascetics withstand the pangs of hunger during prolonged fasts.

In the United States, a resident of Atlanta, Georgia, named John Styth Pemberton, introduced a product similar to Mariani's wine in 1885. Pemberton had previously been marketing patent medicines such as Triplex Liver Pills and Globe of Flower Cough Syrup. The registered trademark for his new product was *French Wine Coca—Ideal Nerve and Tonic Stimulant.* The next year, he added yet another coca product, a syrup that he called Coca-Cola.* The "Cola" in the name indicated the presence of an extract of kola nut—an African product that contains about 2 percent caffeine. That year, Pemberton is said to have sold twenty-five gallons of the syrup. At various times it was advertised as "a remarkable therapeutic agent" and as a "sovereign remedy" for a long list of ailments, including melancholy and (curiously) insomnia.

Coca-Cola became one of the chief targets of Dr. Harvey Wiley in his drive to have a Pure Food and Drug Law enacted. By 1906, when the law was passed, Pemberton's successors as makers of Coca-Cola had switched from ordinary coca leaves to decocainized coca leaves, but caffeine was still included in the formula. In 1909, Dr. Wiley, as head of the Bureau of Food and Drugs, initiated a famous case entitled *United States v. Forty Barrels and Twenty Kegs of Coca-Cola.* The company was charged with adulteration (because the Pure Food Act prohibited adding caffeine to a product) and misbranding (because, it was charged, Coca-Cola contained no coca and little cola). After dragging through the courts for nine years, and following Dr. Wiley's retirement from the government, the Coca-Cola Company agreed to make certain changes in its manufacturing process; in exchange for paying all legal costs, the company was allowed to reclaim its barrels and kegs. (As reported in the January 1971 issue of *Consumer Reports,* Consumers Union laboratory tests confirmed the presence of caffeine in Coca-Cola and in Pepsi-Cola.)

The Harrison Narcotic Act of 1914 mistakenly classed coca products as *narcotics;* and since 1914 coca leaves have been subject to the same penalties as opium, morphine, and heroin. The American coca-leaf interests, however, were powerful enough to secure a special clause in the Harrison Act exempting *decocainized* coca leaves—just as the proprietary opiate interests were able to secure a clause in the act exempting patent medicines containing small amounts of opium, morphine, and heroin.

* These and other Coca-Cola facts are taken from E. J. Kahn's book, The Big Drink: the Story of Coca-Cola (New York: Random House, 1960).

A search of the medical literature has turned up little data to indicate that the chewing of coca leaves or the imbibing of beverages containing small amounts of coca is more damaging to mind or body than the drinking of coffee or tea.† Nor are the physiological and psychological effects notably different; both coca and caffeine are primarily stimulants of the central nervous system.

COCAINE

The chief active ingredient in coca leaves, the alkaloid cocaine, was isolated in pure form in 1844.[1] Little use was made of it in Europe, however, until 1883, when a German army physician, Dr. Theodor Aschenbrandt, secured a supply of pure cocaine from the pharmaceutical firm of Merck and issued it to Bavarian soldiers during their autumn maneuvers. He reported beneficial effects on their ability to endure fatigue.[2]

Among those who read Dr. Aschenbrandt's account with fascination was a poverty-stricken twenty-eight-year-old Viennese neurologist, Dr. Sigmund Freud. Young Freud at the time was suffering from depression, chronic fatigue, and other neurotic symptoms. "I have been reading about cocaine, the essential constituent of coca leaves, which some Indian tribes chew to enable them to resist privations and hardships," Freud wrote to his fiancée, Martha Bernays, on April 21, 1884. "I am procuring some myself and will try it with cases of heart disease and also of nervous exhaustion. . . ." [3] The account of Freud's experiences which follows is drawn largely from the three-volume *Life and Work of Sigmund Freud,* by Ernest Jones.

Freud "tried the effect of a twentieth of a gram [50 milligrams] and found it turned the bad mood he was in into cheerfulness, giving him the feeling of having dined well 'so that there is nothing at all one need bother about,' but without robbing him of any energy for exercise or work." [4]

In addition to taking cocaine himself, Freud offered some to his friend and associate, Dr. Ernst von Fleischl-Marxow, who was suffering from an exceedingly painful disease of the nervous system (which was later to prove fatal), and who was addicted to morphine. Freud

† A leading American authority on drugs of plant origin used by primitive peoples —Professor Richard Evans Schultes, Director of the Botanical Museum of Harvard University—reports that during his plant explorations in the Amazon Valley he chewed coca leaves daily for eight years, did not become addicted, and suffered no apparent physical harm from the custom.[8]

also prescribed cocaine for a patient with gastric catarrh. The initial results in all three cases were favorable. Freud decided cocaine was "a magical drug," and he wrote his fiancée, Martha:

> If it goes well I will write an essay on it and I expect it will win its place in therapeutics by the side of morphium and superior to it. I have other hopes and intentions about it. I take very small doses of it regularly against depression and against indigestion, and with the most brilliant success. . . . In short it is only now that I feel I am a doctor, since I have helped one patient and hope to help more. If things go on in this way we need have no concern about being able to come together and to stay in Vienna.[5]

Freud even sent some of his precious cocaine to Martha, "to make her strong and give her cheeks a red color." Indeed, Dr. Jones writes, "he pressed it on his friends and colleagues, both for themselves and their patients; he gave it to his sisters. In short, looked at from the vantage point of our present knowledge, he was rapidly becoming a public menace." [6]

In a subsequent letter to Martha, Freud wrote more on his personal experience with cocaine:

> Woe to you, my Princess, when I come. I will kiss you quite red and feed you till you are plump. And if you are froward you shall see who is the stronger, a gentle little girl who doesn't eat enough or a big wild man *who has cocaine in his body.* [Italics in original.] In my last severe depression I took coca again and a small dose lifted me to the heights in a wonderful fashion. I am just now busy collecting the literature for a song of praise to this magical substance.[7]

Freud's haste in publishing his findings may astonish twentieth-century readers. On April 21, 1884, he was still only planning to secure some cocaine. On June 18, his essay was completed; and the "Song of Praise" to cocaine was published in the July 1884 issue of the *Centralblatt für die gesammte Therapie.*

This essay, Dr. Jones writes, had "a tone that never recurred in Freud's writings, a remarkable combination of objectivity with a personal warmth as if he were in love with the content itself. He used expressions uncommon in a scientific paper such as 'the most gorgeous excitement' that animals display after an injection of cocaine, and administering an 'offering' of it rather than a 'dose'; he heatedly rebuffed the 'slander' that had been published about this precious drug. This artistic presentation must have contributed much to the interest the essay aroused in Viennese and other medical circles. . . . He even gave an account of the religious observances connected with its use, and mentioned the mythical saga of how Manco Ccapac, the Royal Son of the Sun-God had sent it as 'a gift from the gods to satisfy the

hungry, fortify the weary, and make the unfortunate forget their sorrows.' " [8]

More to the point, Freud described in detail the effects of small doses of cocaine on his own depression. These included "exhilaration and lasting euphoria, which in no way differs from the normal euphoria of the healthy person. . . . You perceive an increase of self-control and possess more vitality and capacity for work. . . . In other words, you are simply normal, and it is soon hard to believe that you are under the influence of any drug. . . . Long intensive mental or physical work is performed without any fatigue. . . . This result is enjoyed without any of the unpleasant after-effects that follow exhilaration brought about by alcohol. . . . Absolutely no craving for the further use of cocaine appears after the first, or even after repeated taking of the drug; one feels rather a certain curious aversion to it." [9] Cocaine, Freud concluded, was useful for "those functional states comprised under the name neurasthenia" [10]—Freud at this time had diagnosed his own depressions as neurasthenic—as well as for indigestion and for the withdrawal of morphine.

Freud also sought to inject cocaine directly into the area of a nerve to block intractable pain. In this he failed, but others succeeded; * and until better agents became available, cocaine was often used as local anesthesia for surgery.

Some of Freud's findings on cocaine as a psychoactive drug were amply confirmed by subsequent research. "The subjective effects of cocaine include an elevation of mood that often reaches proportions of euphoric excitement," Dr. Jaffe reported in Goodman and Gilman's textbook (1965). "It produces a marked decrease in hunger, an indifference to pain, and is reputed to be the most potent antifatigue agent known. The user enjoys a feeling of great muscular strength and increased mental capacity and greatly overestimates his capabilities. The euphoria is accompanied by generalized sympathetic stimulation. As is the case with amphetamine, a disturbed personality is not a prerequisite for cocaine-induced euphoria, and the drug is quite effective in relatively normal personalities." [11]

Freud's experience, however, proved to be only part of the story. In July 1885, a German authority on morphine addiction named Erlenmeyer launched the first of a series of attacks on cocaine as an addicting drug. In January 1886 Freud's friend Obersteiner, who had at first favored cocaine, reported that it produced severe mental disturbances similar to those seen in delirium tremens. Other attacks soon followed; and Freud himself was subjected to "grave reproaches." [12]

* Among those who succeeded was the young American surgeon, Dr. W. S. Halsted.

Freud continued to praise cocaine as late as July 1887, when he published a final defense of the drug. But soon thereafter he discontinued all use of it both personally and professionally. Despite the fact that he had been taking cocaine periodically over a three-year span, he appears to have had no difficulty in stopping. His abandonment of cocaine was no doubt influenced in large part by the experience of Dr. von Fleischl-Marxow, the patient with whom Freud had shared his initial gram of cocaine.

Fleischl suffered from multiple tumors of various peripheral nerves —neuromata—which gave him excruciating pain. He took morphine for this pain. At first Freud's cocaine proved a welcome substitute for the morphine--but Fleischl found it necessary to escalate his cocaine dose. After a year on cocaine he was taking a full gram of it daily—twenty times the dose Freud himself took from time to time. Indeed, Freud noted, Fleischl had spent $428 for a three-month supply of cocaine, an enormous sum in Vienna in those days. On June 8, 1885, Dr. Jones adds, "Freud wrote that the frightful doses had harmed Fleischl greatly and, although he kept sending Martha cocaine, he warned her against acquiring the habit." Thereafter Fleischl developed a full-fledged cocaine psychosis, "with white snakes creeping over his skin." [13] Freud and other physician friends nursed Fleischl faithfully, often throughout the long nights, but to little avail. In June 1885 Freud estimated that Fleischl could live six more months at most; he actually survived for six more pain-wracked years.

Nor was Fleischl's experience unique; subsequent observations were to reveal that repeated use of large doses of cocaine produces a characteristic paranoid psychosis in all or almost all users, and that the tendency to overuse is widespread. A peculiar characteristic of this psychosis is "formication"—the hallucination that ants, or insects, or (as in Fleischl's case) snakes, are crawling along the skin or under it.

Why was Freud, unlike his friend Fleischl, able to use modest doses of cocaine—30 to 50 milligrams injected * under the skin—from time to time for three years without developing either a craving for the drug or a need to escalate the dose? At least three alternative explanations are available. Dr. Jones, a psychoanalyst, believed that it requires an "addictive personality" to establish an addiction; lacking an addictive personality, he declares, Freud did not become a cocaine addict. (He did, however, become addicted to cigars.) The other two explanations are pharmacological.

One holds that there must be some biochemical difference—perhaps a difference in enzymes—between people like Freud who can take a

* Freud also took cocaine orally.—Eds.

particular addicting drug without becoming addicted and people like Fleischl who escalate the dose and become addicted. This hypothetical difference in enzymes may (or may not) be hereditary. The third explanation relates the addiction (or lack of it) to dosages and frequency of use. Because Freud took cocaine only occasionally, according to this theory, he had no need to escalate his dose. And because he did not escalate the dose, he did not become addicted. Some other explanation, of course, may ultimately prove true.

By 1890, the addicting and psychosis-producing nature of cocaine was well understood in medical circles; yet for another twenty years it does not appear to have occurred to many people to demand a *law* against the drug.* In the United States, cocaine was widely used not only in Coca-Cola but also in "tonics" and other patent medicines, including very popular "catarrh cures"—for, like the amphetamines, cocaine has the effect of reducing mucous membrane swelling, and thus enlarging the nasal and bronchial passages. This property no doubt first gave users the idea of *sniffing* cocaine, a common form of cocaine use even today. "Most of the cases of the cocaine habit have been admittedly created by the so-called catarrh cures," Dr. Charles B. Towns wrote in *Century Magazine* in 1912, "and these contain only two to four percent of cocaine.† In the end, the snuffer of catarrh powders comes to demand undiluted cocaine." [15]

Cocaine addiction differs from opiate addiction, and from alcohol and barbiturate addiction, in at least two respects. A cocaine user, even after prolonged use of large doses, does not, if deprived of his drug, suffer from a dramatic withdrawal crisis like alcoholic delirium tremens or like the opiate withdrawal syndrome. The *physical* effects of cocaine withdrawal are minor. This has led many authorities, mistakenly, to classify cocaine as a nonaddicting drug. However, cocaine withdrawal is characterized by a profound psychological manifestation —*depression*—for which cocaine itself appears to the user to be the only remedy; cocaine addiction in this respect resembles tobacco addiction more closely than it resembles opiate addiction or alcoholism. The compulsion to resume cocaine is very strong.

Moreover, cocaine addiction can lead to a severe psychosis *while the user is still on the drug*. This is in contradistinction to the opiate withdrawal syndrome and to the delirium tremens of alcoholism or

* Dr. Charles B. Towns wrote (1912): "When an overseer in the South will deliberately put cocaine into the rations of his Negro laborers in order to get more work out of them to meet a sudden emergency, it is time to have some policy of accounting for the sale of a drug like cocaine." [14]

† "Street Cocaine" sold on the New York black market in 1970 was reported to contain about 6 percent pure cocaine.

barbiturate addiction, which set in hours or days *after* the drug is withdrawn.

Decades ago, cocaine users discovered that a mixture of cocaine and morphine or heroin relieves the excess agitation and tension produced by large doses of pure cocaine. The users of morphine and heroin similarly discovered that the mixture increases both the "bang" or "rush" or "flash" and the mood elevation produced by their favorite drug. The combination came to be known as the "speedball," and it has long been popular among some addicts in Britain, the United States, and elsewhere.

Since 1914, the possession, sale, and giving away of cocaine have been subject to the same dire federal penalties as those governing morphine and heroin; and most state laws similarly identify cocaine as a "narcotic."

During the 1940s, 1950s, and most of the 1960s, the smuggling of cocaine into the United States was curtailed and the black market in cocaine was relatively small. The reduced use of cocaine, however, can hardly be attributed, even in part, to law-enforcement efforts. Rather it was the result of pharmacological research. Cocaine was replaced by a new group of synthetic drugs, the amphetamines, which were available far more cheaply than cocaine after 1932, and which had certain other advantages over the natural imported product. Late in the 1960s, when narcotics law-enforcement agencies began cracking down heavily on the amphetamine black market, cocaine smuggling and cocaine use enjoyed a renaissance.

By the mid-1960s the market for amphetamines and related stimulants was being supplied in at least four ways: (1) physicians were prescribing these drugs for patients; (2) domestic supplies of legal stimulants were being diverted to the black market; (3) legal stimulants were being exported from the United States to Mexico and smuggled back into the United States; (4) speed labs were manufacturing illicit stimulants.

As the 1960s drew to a close, however, all four of these sources of supply were under increasing pressure. The medical journals carried papers warning physicians not to overprescribe stimulants. The United States Bureau of Customs was on guard against stimulant smuggling. The Bureau of Narcotics and Dangerous Drugs, the Food and Drug Administration, and state and local police agencies battled against both the diversion of legal stimulants and the illicit speed labs. Securing the precursor chemicals for speed manufacture became increasingly risky. The net effect was a notable expansion of a fifth source of supply of stimulants—a boom in *cocaine* smuggling.

"More and more cocaine, worth millions of dollars," correspondent

George Volsky reported from Miami in the New York *Times* for February 1, 1970, "is being smuggled into the United States from Latin America, much of it through this area, according to Federal law enforcement officials and narcotics agents." [16]

Volsky then went on to quote Dennis Dayle, supervisory agent of the Federal Bureau of Narcotics and Dangerous Drugs in Miami, as saying: "The traffic of cocaine is growing by leaps and bounds. It was insignificant only a few years ago, but now it has become a significant problem." [17]

Agent Dayle failed to link the revival of cocaine smuggling with the efforts his bureau was making to curtail the availability of speed. But John J. Bellizzi, director of the New York State Bureau of Narcotics in Albany, explained to Volsky why cocaine smuggling was on the increase—"because younger drug users are finding out about it. The kids are beginning to learn that it's pretty much like speed." [18]

Nationally, Volsky reported, Bureau of Customs cocaine seizures rose from 22 kilograms in 1967 to 90 kilograms in 1969.* And he quoted a rule-of-thumb estimate that for every kilogram seized, ten kilograms get through—or an estimated 900 kilograms successfully imported during 1969. (Nine hundred kilograms is enough to provide from 18,000,000 to 27,000,000 cocaine doses of the size Sigmund Freud took during the 1880s.)

Volsky added details concerning the economics of cocaine smuggling —details reminiscent of the heroin smuggling market. Pure cocaine, he was informed by Wilbur Underwood of the Bureau of Customs, can be purchased in Latin America for $3,000 to $5,000 per kilogram (2.2 pounds). After importation, it is diluted or "cut" so that one gram of pure cocaine produces 16 grams of "street" cocaine. The street cocaine, Underwood told Volsky, is sold at $50 a gram. Thus the 900 kilograms of pure cocaine supposed to have been smuggled into the United States in 1969 represented 14,400 kilograms of street cocaine worth $50,000 per kilogram, or—if those Bureau of Customs figures are to be believed †—$720,000,000.

With so vast a total markup, it is easy to see why smugglers who lost $495,000 worth of cocaine (at South American prices) to the Bureau of Customs in 1969 continued to smuggle cocaine in 1970 and

* Seizures increased markedly in 1970; indeed, 200 kilograms were seized in New York and Miami during the last three months of 1970. The New York *Times*, however, commented: ". . . few of the men involved in this dangerous work have any illusions about reducing the flow." [19] As in the case of heroin, the arrest of a courier does not close off a conduit.

† One observer has suggested that the law-enforcement practice of "attributing 'retail' value to bulk merchandise [such as cocaine] is similar to attributing the value of 100 Christian Dior dresses to a bale of cotton." [20]

1971. Even if the Bureau of Customs retail price estimates are divided by ten, the loss due to interception of smuggled consignments remains trivial in comparison to the total markup.

On the basis of data supplied by Bureau of Narcotics supervisory agent Dayle, Volsky described a typical smuggling operation in these terms:

> There are two principal partners, one controlling operations in South and Central America and the other in Miami.
>
> The syndicate boss abroad, through a number of subordinates, buys coca leaves, sets up laboratories, maintains contact with local officials, arranges for payoffs, and recruits and dispatches local couriers with cocaine to the United States, mostly by plane.
>
> The Miami boss, like a head of a large commercial corporation, has deputies in charge of travel, transportation, personnel, security, accounting, and quality control—"cutting" pure cocaine for wholesale and retail trade.
>
> Several years ago, modest Latin-American women were usually employed as "body carriers," smuggling into Miami from two to four kilograms of pure cocaine. . . . Some women carriers posed as being pregnant. . . . After passing through Customs at the Miami International Airport, these couriers—who were given precise but simple instructions and who had little information about the syndicate—usually proceeded to a downtown hotel where cocaine and cash transportation payment changed hands.[21]

Once federal agents learned of these procedures, of course, it was easy to keep an eye open for modest Latin American women—especially the ones who looked pregnant. After a few of them had been arrested, however, the syndicates simply changed the style of their couriers. Subsequent reports indicated that couriers looked like businessmen or college students.

The United States law-enforcement system tends to catch price-cutting newcomers to the black market rather than established syndicates; law enforcement thus tends to perpetuate these syndicates and to keep prices high. A United States narcotics agent stationed in South America explained to a New York *Times* reporter in some detail just how this happens in the case of cocaine.

The narcotics agent, "who cannot be named," told of a small-time procurer of prostitutes in New York City who became interested in the high prices paid by his girls for cocaine, and decided to get in on the racket. "When he learned that the stuff came from Chile, he bought a $550 roundtrip airline ticket and came down," [22] the *Times* reported on January 25, 1971. Cocaine is readily available in kilo lots in Chile and other Latin American countries. The New York procurer bought a kilo for $1,800. "An experienced buyer could have gotten the cocaine for about $900," the United States narcotics agent commented.

The procurer safely returned to New York with his kilo, adulterated it to make two kilos, and sold them for $15,000 each to the dealer who had been supplying cocaine to his girls. This was price-cutting, and horning in on the trade of the established importer who had previously supplied the same dealer. Following a second trip to South America, the procurer cut prices even lower—selling 75 percent pure cocaine for $18,000 to $20,000 a kilo.

Retribution swiftly followed. "A member of an organized drug-peddling group informed on the independent operator and he was seized [by the authorities] upon returning from his third trip to Chile." [23] It would be hard to find a clearer example of how vigorous United States law enforcement buttresses the monopoly of the established distributors of illicit drugs—and thus keeps both consumer prices and the profits of established traffickers exorbitantly high.

The flooding of the market with cocaine after 1968 represented a threat to the established black-market amphetamine interests. But the United States Bureau of Narcotics and Dangerous Drugs, which in 1968 had from four to seven agents in its Miami office, increased its Miami staff to over thirty agents early in 1970—and more were being trained.[24] To the extent that such increased cocaine policing is effective, of course, it will protect the illicit speed market from too much cocaine competition.

The developments of the 1960s can now be summed up. The decade began with almost all stimulants being supplied by reputable manufacturers; their low-cost amphetamines had almost driven cocaine off the market. The withdrawal of intravenous amphetamines from the legal market opened the door for the illicit speed labs. The Drug Abuse Control Amendments of 1965 curbed the direct diversion of legal amphetamines to the black market; this opened the door for the smuggling of exported amphetamines back into the United States. By 1969, law-enforcement efforts had raised black-market amphetamine prices and curbed amphetamine supplies sufficiently to open the door for renewed cocaine smuggling. All of these modes of supplying the black market shared the benefits of vigorous law enforcement, for it was law enforcement that prevented the flooding of the market with excess supplies of both cocaine and amphetamines that might threaten the price structure. If the various black-market suppliers had conspired among themselves to limit production and imports, they would have been in violation of the antitrust laws. But no conspiracy was necessary; law enforcement limited supplies, thus playing the role that is ordinarily played by conspiracies in restraint of trade.

Viewed from this perspective, the proposals current in 1971 to ban (with certain minor exceptions) the legal use of amphetamines, even

on a doctor's prescription, seem less persuasive. Such a measure, it is true, would promptly curb the use of these drugs by patients *under medical supervision;* but there is not the slightest reason to expect that it would significantly curtail the overall consumption of amphetamines, cocaine, and other stimulants. On the contrary, it would deliver over to the cocaine smugglers, illicit speed labs, and other black-market suppliers at least some of the millions of users who now secure their euphoriants and central nervous system stimulants on a doctor's prescription—and it would thus protect the black market from the last remaining vestiges of low-priced legal competition. This, of course, was precisely what the Harrison Narcotic Act had accomplished for the morphine and heroin black market back in 1914.

A SLIGHTLY HOPEFUL POSTSCRIPT

While law enforcement serves mainly to raise prices and thus attract additional black-market entrepreneurs rather than to curb consumption, and while antidrug propaganda campaigns have helped to popularize drugs like the amphetamines more than to discourage their use, the current outlook is not altogether hopeless. Progress is actually being made against the "speed-freak" phenomenon in its original home and major citadel, California—and no doubt elsewhere as well.

California observers of the "youth drug scene" report that *fewer young people are being attracted to speed.* There is nothing mysterious about this. New arrivals on the youth drug scene look at the speed freaks, the acid (LSD) droppers, the grass (marijuana) smokers, and decide to stick with acid and grass. They don't want to become like the speed freaks. The speed-freak phenomenon is in this respect self-limiting.

Young drug users need not rely solely on their own observations, moreover, for throughout the youth drug scene today there are "indigenous institutions," such as free clinics and "hot lines," devoted to helping them. These institutions are not trying to stamp out illicit drug use. Instead, most of them are trying to *minimize the damage done by drugs,* both licit and illicit. Thus, instead of railing against marijuana, they are pointing out to drug novices just what happens to the speed freak.

Unlike other warnings against drugs, the comments of these indigenous institutions ring true to young people. One reason is that they *are* true; youthful recruits to the drug scene can confirm what they are told merely by looking around them at the drug scene's speed

freaks. Another reason is that the indigenous institutions do not destroy their own credibility with dire warnings against marijuana—warnings that are *not* confirmed when young people look around them. Finally, the indigenous institutions are dedicated, and are *seen* to be dedicated, to helping young drug users rather than to repressing them. What they say need not be discounted by the young. As a result of the efforts of these indigenous institutions, and of young drug users' own observations, the number of new users recruited to speed—the mainlining of amphetamines in large doses—appears to be dropping. The drug scene itself, in short, is beginning to curb speed mainlining after the United States Bureau of Customs, the United States Bureau of Narcotics and Dangerous Drugs, the Food and Drug Administration, and nationwide propaganda efforts have failed.

A second factor in curbing the "speed-freak" phenomenon is reminiscent of Dr. W. S. Halsted, who cured himself of his cocaine addiction—a close parallel of speed addiction—by going on morphine and thus salvaging his surgical career. California speed freaks in large number are similarly deserting speed for heroin. This reduction in the number of speed freaks spreading the speed gospel also tends to curb the recruitment of new speed freaks. If these trends continue, the speed freak may in the not too distant future be merely a historical oddity—unless, of course, a new wave of antispeed propaganda alerts a new generation of young people who have never seen a speed freak, and a new wave of speed mainlining is triggered.

The future of the ex-speed freaks who convert to heroin depends on the future of heroin addicts generally. If we leave them at the mercy of the American black market, the high prices and adulterants will ruin and perhaps kill them. But this is an avoidable outcome if society decides to avoid it.

NOTES

Coca Leaves

1. Hector P. Blejer, "Coca Leaf and Cocaine Addiction—Some Historical Notes," *Canadian Medical Association Journal,* 93 (September 25, 1965): 701.
2. Ibid.
3. Ibid.
4. W. G. Mortimer, *Peru History of Coca, "The Divine Plant" of the Incas, With an Introductory Account of the Incas and Andean Indians of Today* (New York: J. H. Vail and Co., 1901), pp. 28 and 119; cited by Blejer, p. 701.
5. Jerome H. Jaffe in *Goodman and Gilman,* 3rd ed. (1965), p. 299.
6. J. L. Corning, *Local Anesthesia in General Medicine and Surgery, Being the Practical Application of the Author's Recent Discoveries* (New York: D. Appleton and Co., 1886), p. 21; cited by Blejer, p. 702.
7. Mortimer, *Peru History of Coca,* p. 179, cited by Blejer, p. 702.
8. Personal communication.

Cocaine

1. *Remington's Pharmaceutical Sciences,* 4th ed. (Easton, Pa.: Mack Publishing Co., 1970), p. 1067.
2. Theodor Aschenbrandt, "Die physiologische Wirkung und die Bedeutung des Cocains," *Deutsche medizinische Wochenschrift* (December 12, 1883), cited by Ernest Jones, *The Life and Work of Sigmund Freud, Volume I (1856–1900)* (New York: Basic Books, 1953), p. 80.
3. Ernest Jones, *Life and Work of Sigmund Freud,* I, 80.
4. Ibid.
5. Ibid., p. 81.
6. Ibid.
7. Ibid., p. 84.
8. Ibid., p. 82.
9. Ibid., pp. 82–83.
10. Ibid., p. 83.
11. Jerome H. Jaffe in *Goodman and Gilman,* 3rd ed. (1965), pp. 298–299.
12. Ernest Jones, *Life and Work of Sigmund Freud,* I, 94.
13. Ibid., p. 91.

14. Charles B. Towns, "The Peril of the Drug Habit," *Century Magazine,* 84 (1912): 586.
15. Ibid., p. 583.
16. New York *Times,* February 1, 1970.
17. Ibid.
18. Ibid.
19. New York *Times,* January 25, 1971.
20. Jerry Mandel, "Myths and Realities of Marijuana Pushing," *Marijuana Myths and Realities,* ed. J. L. Simmons (North Hollywood, Calif.: Brandon House, 1967), p. 73.
21. New York *Times,* February 1, 1970.
22. New York *Times,* January 25, 1971.
23. Ibid.
24. New York *Times,* February 1, 1970.

INDEX

Acosta, Father Joseph de, 111, 115, 132–33
addiction: definitions of, 297, 298; enzyme role in, 352–53; heroin vs. cocaine, 297–98, 304, 313–14; opiate, 4, 21, 32, 250, 251, 330, 353; psychological vs. physical, 297, 298, 331, 342. *See also* coca, coca leaves; cocaine
"addictive personality," 352–53
alcoholic beverages, 11, 17, 18, 61; vs. cocaine, 299–300, 351, 353; cocaine used with, 302; coca used with, 40; effects of, compared with coca, 38–39, 157–58, 223–24; vs. illicit drugs, 344, 345, 346; Indian use of, 157–58; nutritive value of, 215–16
alcoholism, 32, 33, 53, 215, 251, 263, 272, 353; coca and cocaine as cures for, 5, 226, 279
alkaloids: individual reactions to, 228; vegetable, 199. *See also* coca alkaloids
Almagro, Diego de, 101–02, 103, 104, 105, 108, 110
Amazon Basin, 20, 27, 56, 161–62, 321, 323–29
Amazon River, source of, 144–45
amphetamines ("speed"), 282, 298, 299, 300, 303, 344, 345, 351, 353, 354; black-market, rise in, 357–58; cocaine cut with, 319–20, 340, 341; decline in speed-freak use of, 358–59
anaesthesia, 60; in coca chewing, 218; 322; local, 21, 44, 45–46, 53, 65, 184, 218–21, 225, 275, 320, 329, 341, 342, 351; physiology of, 221–22. *See also* cocaine
Andes Mountains, 7, 52, 119, 122–23, 161, 347
Andrews, George, 3–19
animal experiments, 274–76, 344–45
Anslinger, Harry, 297
ants (*cuquis*), 168
Anything Goes, 6, 280–81
aphrodisiacs, 6, 30, 227
Argentina, coca chewing in, 269
Aschenbrandt, Theodor, 349
asthma, 30, 31, 44, 234
Atahualpa, 57, 87, 100, 105, 106–07, 108–09, 134, 137
athletes, coca use by, 210–11
atropine, 21, 189, 220, 222, 229
Axton, Hoyt, 282, 283
Aymara Indians, 24, 57n, 67–68, 75, 133

bananas, 122
Bang, Miguel, 148
Bankhead, Tallulah, 281
barbiturate addiction, 4, 353, 354
Barham, Henry, 140–41
Baudelaire, Charles, 279
Beard, George M., 214
Bennett, Alexander, 225–26, 240
benzocaine, cocaine cut with, 296, 341
benzoyl-ecgonine, 183, 184, 185, 186, 224, 225, 273
Bernays, Martha, 349, 350, 352
betel, 61, 273; coca confused with, 139–40, 142
Big Drink, The, 8, 12
Bignon, A., 187, 191, 229
Blake, S. F., 9
Blejer, Hector P., 346, 347
Blériot, Louis, 13, 243
blood: cocaine in, 266, 332, 337, 338; coca's effect on waste matter in, 31, 211, 213, 214, 226, 235, 237, 240, 334
Boerhaave, Hermann, 178
Bolivia, 12, 24, 27, 28, 29, 30, 33, 42, 67–68, 269, 322; coca leaf production in, 5–6, 271; coca mastication process in, 27; coca plant cultivation in, 20, 145–46, 321
Bolivian coca (Huanuco), 13, 170–71, 173, 205, 206
bonbons, cocaine, 5
Boone, Richard, 283
brain, 213–14; cocaine's effect on, 299
Brando, Marlon, 283

Brazil: coca chewing in, 151; coca cultivation in, 161–62; Indians of, 27
Brecher, Edward M., 344–59
Breuer, Joseph, 219
Browne, Patrick, 159
Bureau of Customs, U.S., 354, 355, 356, 359
Bureau of Narcotics and Dangerous Drugs, U.S., 286, 297, 354, 355, 356, 357, 359
Burrell, Walter, 284

Cabieses Molina, Fernando, 264–68
cacao, 61, 335–36. *See also* cocoa
caffeine, 10, 43, 201, 224, 225, 240, 320, 348; vs. "scapegoat" drugs, 344–45, 346
Candolle, Augustin Pyrame, 139, 160
cannabis, 13. *See also* marijuana
carbohydrates, 210, 237–38
carbon, 199, 200
carbon dioxide gas, 11
carbonic acid, 198, 200, 203, 204
cardiac problems, coca used for, 31, 38, 217–18
"Casey Jones," 283
cassava, 324, 326, 328
Castelnau, Count de, 144
Caudwell, Eber, 228–29
Cavanilles, Antonio José, 139, 158–59
Cecropia tree, 27, 327, 328
cell structure, chemical processes in, 198
central nervous system: coca and, 212–15, 224, 226, 349; cocaine and, 15, 224, 229, 266, 299, 330, 331, 342, 349
Ceylon, 13; coca cultivation in, 43, 172, 321
Chandler, Raymond, 281
Chaplin, Charlie, 6
Charcot, Jean, 243
Charles V, King of Spain, 87, 106, 125
chasquis (couriers), coca use by, 25, 83, 124, 125, 142, 152
Chibcha Indians, 24, 151
chicha (Indian beverage), 23, 324, 325, 326, 327, 329
Chile, 110, 269, 356–57; coca cultivation in, 20, 321
chloroform, 11, 60, 220, 228
chlorophyl, formation of, 203
chocolate, 60, 122, 239, 336
Christison, Sir Robert, 175, 208–10, 267
chuspas (Indian coca pouches), 7, 23, 24, 27, 77, 93, 150
Cieza de Leon, Pedro, 58, 128–30, 131, 136, 178
cigarettes, coca-leaf, 5
cinchona, 30, 60, 138, 141; alkaloidal yield of, 205, 206; Far Eastern cultivation of, 171, 202, 205; Indian gathering of, 116, 154; "mossing" of, 205
cobalt test for cocaine purity, 341
Cobo, El P. Barnabé, 29–30
coca, coca leaves: "active principles" of, 333–34 (*see also* coca alkaloids); addiction and, 65–67, 68–70, 239, 242, 271–72, 329; advocates of, 10, 12–13, 21, 148–49, 243–46; vs. alcohol, effects of, 38–39, 157–58, 223–24; alkali used with, in mastication, 58–59, 150–51, 169, 170, 171, 179, 207, 208, 248, 270, 273, 321–22, 327; altitudes used at, 29, 266–67; as aphrodisiac, 30, 227; archeological findings on use of, 270–71; aroma of, 13–15, 17, 147–48, 150, 162, 172, 174–75, 182; bases of, controversy over, 187–89; as beverage, 5, 8–9, 10–13, 17, 18, 29, 43, 45, 147–48, 217, 223, 224, 233, 234, 243–46, 247–48, 269, 347, 348, 349; Bolivian, 13, 170–71, 173, 205, 206; central nervous system and, 212–15, 224, 226, 349; chewing of, 6, 8, 12, 14, 18, 20, 21, 22–28, 29, 40, 42, 67–68, 127, 129–30, 136, 139–40, 207–11, 218, 262–63, 264, 269–70, 321–22, 325–26, 349; Church opposition to, 7–8, 57–58, 59, 70–71, 111, 112; Church tithes on, 136, 146; classic type of, 168–69; classification of, 15–16; vs. cocaine, 9, 10, 14, 15, 16, 32, 33, 64–65, 147, 173, 184–85, 224, 239, 265–66, 268, 272, 330, 333–34, 335; cocaine and effects of, 269–76; cocaine isolated from, 21, 64, 181, 272, 329, 334, 349; and cocoa, confusion of, 62, 63, 239, 335–36; commercial role of, 5–6, 125, 134, 144–45, 170, 205; concentration vs. dosage of, 265; curing and preservation of, 166, 175, 191, 206; decocainized, 8–9, 12, 17, 18, 348; depurative properties of, 31, 211, 213, 214, 226, 235, 237, 240, 334; digestion aided by, 28, 44, 216–18, 236, 334; dosages of, 33, 38, 39, 40, 228, 265; duration of effects of, 40, 42, 152; early writings on, 129–41; elimination from body of, 230–31; energizing effects of, 14, 15, 23, 39, 42, 43, 44, 50, 52, 56,

coca, coca leaves (*cont.*)
140, 146–47, 207, 237–38, 264, 269; and fatigue experiments on, 207–11; hunger and thirst appeased with, 23, 25, 28, 42, 44, 129, 140, 207, 210, 227, 236–37, 263, 269, 347, 348; legal bans on, 22, 34, 268, 271, 322, 348; longevity of users of, 30–31, 65, 70, 127, 143; Mariani's selection of, 13, 147–48; medical ignorance and errors about, 51, 173, 224–25, 239–40; medical uses of, 5, 9, 20, 28–32, 34, 44, 52, 53, 66, 146, 156, 205, 207, 212, 217–18, 226–28, 232–42, 247–48, 251, 333, 334–35; memory and, 23, 25, 58, 84; military use of, 140, 142, 217; moral corruption ascribed to, 69–70; nitrogenous influence in, energy and, 200–01, 237–38; nutritive value of, 28, 59, 143, 146, 216, 235–38, 334; Peruvian, 13, 147, 170–71, 173, 187, 204, 205, 206; in pharmaceutical preparations, 44–45; physicians questioned on, 239–42; physiological effects of, 21, 27–33, 38–39, 52, 54, 172, 173, 212, 216–31, 235–42, 273; "poisoning" by, 65–67, 228–29; as powder, 270, 325–29; prices of, 134, 175–76; psychic effects of, 9, 143, 152, 208, 228–29, 262–63; scientific research and discussion of (19th century), 141–50; search for energy source in, 177–81; soporific effects of, 39–40; stimulation by, experiments on, 222–24; stress and, 212; sucking of, 16–17, 26; transportation of, 118, 176; varieties of, 13, 63, 170–71, 173, 205; voice production and, 232–35. *See also* coca plant; Incas, coca use of; Indians (South American), coca use of; Spaniards

coca alkaloids, 3, 8–10, 14, 32, 33, 53, 64, 65–66, 147, 149, 150, 170, 171, 173–74, 178–97, 200, 264, 321; "active principle" concept and, 333–34; alkali intake and, 273–74; crystallizable vs. uncrystallizable, 185–86, 205–06; curing method and, 206; effect of mosses and lichens on, 168, 205; elevation and yield of, 204; isolation of, 179–81; list of, 21; physiological effects of, 223–24, 273, 333–34; plant variety and, 205–06; proportions of, in leaves, 191–92; temperatures and, 203; in young vs. mature leaves, 203

Coca-Cola, 335; and cocaine culture, 285; cocaine use in, 5, 10, 277, 353; decocainized flavoring agent in, 8–9, 12, 17, 18, 348; origin and history of, 10–12, 31, 348

Coca-Cola Corporation, 8–9, 10–12, 17

cocaine: abuse of, dangers in, 5, 16, 17, 259–61, 286–87, 299–301, 330, 331–34, 337–39, 342–43, 352–54; addiction and, 4, 32, 65, 69, 228, 230, 249, 250–58, 266, 272, 297–98, 304, 313–14, 330, 338, 339, 342, 351, 352–54, 359; anaesthetic action of, 21, 22, 44, 50, 53, 65, 184, 187, 197, 218–21, 225, 228, 275, 299, 319, 329, 337, 342, 351; in animal experiments, 274–75; in Bolivian coca, 171, 173; care and controls in use of, 337–41; central nervous system affected by, 15, 224, 229, 266, 299, 330, 331, 342; characteristics of (U.S.P.), 197; coca leaf selection and, 65–66, 148, 173–74; crude, assay of, 196–97; crude, associate alkaloids of, 190; crude, as "base," 331–32; crystallizable vs. uncrystallizable, 185–86, 205; cutting (adulterating) of, 278, 279, 293, 296, 319–20, 331, 332, 339–41, 355, 357; dealers in, 289–317; depression after use of, 4, 320, 331–32, 339, 353; depression treated with, 256, 350, 351; descriptions of, 181, 339–40; excessive dosages of, experiments with, 228–30; in eyelid, 337; in eye surgery, 9, 65, 149, 218–20, 221; "hard drug" label and, 277, 297, 330–31; heroin mixed with, 281, 331, 335, 354; "hip" community and, 278–79, 282; imitations of, 278, 340; as "in" drug, 3, 277–88; injecting (shooting) of, 5, 248, 257, 265, 279, 303–04, 319, 330, 332, 337, 338–39, 351; law and, 5, 6, 280, 286, 291, 309–11, 319, 330–31, 348, 353, 354, 355–58; manufacturers of, 184, 190, 196, 278, 322; medical applications of, 21, 22, 44, 45–49, 65, 68, 149, 184, 218–22, 227, 247, 249–50, 255, 272, 279–80, 334, 353; medical disputes over, 247–58, 264–68; medical press and, 68–69, 253; methods of use of, 279, 303–04, 319, 337; military use of, 349; music subculture and, 278, 280–88; "narcotic" label and, 280, 297, 319, 354; nasal problems in use of, 259–61, 287, 332, 338, 340; nicknames for, 281;

cocaine (*cont.*)
odor of, 181, 196; opiate addictions treated with, 219, 226, 249, 280, 349, 351, 352; vs. opiates, 21, 32, 69, 223–24, 250, 251, 252, 253, 297–98, 304, 313–14, 353; oral use of, 265–66, 299, 319, 332–33, 337, 339; physiological effects of, 173, 218–25, 248, 249, 264–68, 273, 279, 299–301, 302, 332–33, 337, 338–39, 342; poisoning by, symptoms and treatment of, 228–30, 342–43; preparation of, small-scale, 192–95; prices of, 4, 6, 7, 175, 184, 278, 279, 292, 293, 300, 303, 304, 305, 312, 331, 352, 355, 356, 357; psychic effects of, 3–4, 22–23, 39–42, 218, 248–49, 274, 321, 330, 331, 332, 341–42, 350–52; psychological dependence on, 298, 331, 338, 339, 342, 353; psychoses in users of, 352, 353; research on (19th century), 181–98; as rich man's drug, 3, 6, 7, 320; sale of, 6, 278–79, 281–82, 289–317, 335, 339, 355–57, 358; salts of, 45–49, 197, 332; senses affected by, 221, 342; sex and, 6, 7, 249–50, 286, 320, 337; smuggling of, 6, 286, 354–57, 358; snorting of, 5, 17, 259–61, 279, 299–303, 319–20, 330, 332, 337, 338, 340, 353; stimulating effects of, 4, 221–24, 262, 265, 266, 320, 330, 341–42, 349, 350, 351; synthetic, 190–91, 275, 320, 334; tests for purity of, 195–96, 339–41; threshold theory of, 6; tolerance to, 6, 298, 332; tourist quest for, 3, 318–20; withdrawal from, 266, 299, 302, 330, 352, 353–54. *See also* coca, coca leaves
"Cocaine Blues," 280
"cocaine habit," reports of disputed, 65, 69, 228, 230, 249, 250–52, 253–58
cocaine-morphine habit, 252
cocaine mythology, 286
cocaine subculture, 6–7, 277–88, 342
cocainism, meaning of, 272
cocaism, meaning of, 272
cocamine, 185–86, 187–88, 224
Coca Pâté, 217
coca pickers, 165
coca plant (shrub), 3; altitude and growth of, 204, 206; botanical characteristics of, 21, 52, 56–57, 159–60, 166–67; botanical classification of, 158–59; crop yields of, 175; cultivation of, 10, 20, 43, 79, 81, 111, 112–13, 134, 135–36, 144–45, 161–68, 203, 271, 321, 326–27, 347; electrical conditions and, 204–05; Far Eastern cultivation sought for, 171–72; flowers of, 21, 166; frost fatal to, 203; fruit of, 167; habitats of, 160–62; harvesting of, 164–65; humidity and, 163, 204, 205; inaccuracies about, 135; mosses and lichens on, 168, 205; in nurseries, 163–64; pests and diseases of, 167–68; seeds of, 167; soil required for, 162–63; temperatures grown at, 162, 203–04; weeds harmful to, 168; wild species of, 20, 160–61. *See also Erythroxylon*
coca plantations (cocals), 111, 112–13, 134, 135, 161, 205–06, 271; wages on, 145–46; warehouses on, 165–66
coca tea, 29, 217, 223, 269
coca wax, discovery of, 182
Coca Wine, 10, 12–13, 45, 147–48, 224, 233, 234, 247–48, 347, 348; testimonials to, 243–46
cocoa, 345; coca confused with, 62, 63, 239, 335–36
cocrylamine, 188
coffee, 54, 60–61, 240, 250, 254, 344–45, 346; after coca, 40; cultivation of, 172, 204
"coke-head," 281
coke spoons, 277–78, 282, 283, 285, 287, 290
cold, common, 233
Colombia, 24, 25, 26, 27, 102, 151, 152, 160, 322, 327; cocaine market in, 318–20; coca plant cultivation in, 20, 321
Consumers Union Report, 344–59
Corning, J. L., 347
Cowley, Abraham, 72–73
curare, 222
cuskohygrine, 8–10, 15, 17, 269, 274, 275
customs surveillance, 3, 354, 355–57
Cuzco, Incan royal city, 83, 85, 87–88, 90, 94, 107–08, 109, 110, 113, 122, 125, 131, 145, 161

Darwin, Charles, 178
dealers: advancement of, 293, 305–09, 311–12; business practices of, 293–94, 305–09, 312, 315–16; police and, 291, 309–11; portrait of, 289–317; prison terms for, 312–13; vs. "pushers," 293; record-keeping by, 294; as undercover agents, 307–08

depression: as absent in coca use, 42, 208, 224, 248; in cocaine use, 4, 320, 331–32, 339, 353; treatment of, 31, 213, 256, 351
De Quincey, Thomas, 53–54
dextrose, cocaine cut with, 296, 340
digestion, coca as aid to, 28, 44, 216–17
digitalis, coca as replacement for, 217–18
divination, coca used in, 23, 24, 89
"Dope Head Blues," 280
Dowdeswell, G. F., 224–25, 240
dreams, coca-produced, 40
drug abuse, causes of, 335
Drug Abuse Control Amendments (1965), 357
"drug gourmet," description of, 282
drug legislation, 11, 18, 32, 280, 348
drugs, scapegoat, 344–45. *See also specific drugs*
Dumas, Alexandre (younger), 243–44
Dupree, Champion Jack, 280
Duse, Eleonora, 13, 244

Easy Rider, 282–83
ecgonine, 8, 9, 191, 273, 274, 275; derivatives of, 21; discovery of, 183
Ecuador, coca plant cultivation in, 20, 231
Edison, Thomas A., 12, 244
Edson, Cyrus, 207, 233
El Dorado, 110
Elsberg, Louis, 218, 235
enemas, cocaine, 337
energy, sources of, 199–200
Errera, Louis, 203
Erythroxylaceae, 20, 159
"Erythroxyline," 180
Erythroxylon aureolatum, 159
E. bolivianum Burck, 20, 170, 171
E. coca, 3, 159, 321, 346
E. coca Lamarck, 20
E. Hondense, 141, 160
E. novogranatense, 20, 170–71, 188, 206
E. Peruvianum, 144
E. Spruceanum, 170
E. truxillense Rusby, 20
ether, 220, 228, 251
ethyl alcohol, 11, 17. *See also* alcoholic beverages
eye irritations, coca used for, 30
eye surgery. *See* ophthalmic surgery

Fabré, Emile, 244
fantasies, coca-produced, 41, 42
fatigue, 264–68; causes of, 212–13; experiments with coca and, 207–11
Fauvel, Charles, 218, 235
Fawcett, Col. P. H., 12
Fewkes, J. W., 87
Flammarion, Camille, 12, 244
Fleischl-Marxow, Ernst von, 349, 352–53
Fonda, Peter, 282–83
food: coca as, 28, 59, 143, 146, 216, 235–38; definition of, 235–36
"formication," 352
fractures, coca in treatment of, 30
France, Anatole, 244
French Coca Wine, 10, 348
Freud, Sigmund, 10, 16, 38, 226, 299n, 329; cocaine used by, 4, 219, 279–80, 349–53, 355

Garcilasso de la Vega, 23, 57n, 84, 109, 112, 133, 134–35, 136–37, 165, 178
Gautier, Théophile, 279
genitals, cocaine applied to, 249–50, 337
Germany, cocaine use in, 6
Gibbon, Lardner, 144–45
Gibbs, Benjamin F., 156, 217
Gilman, Alfred, 269, 287, 351
Goering, Hermann, 6
Goethe, Johann Wolfgang von, 159
gold, Spanish quest for, 7, 101, 107–08, 109, 110, 114–15
gold washing, 155
Goodman, Louis, 269, 287, 351
Gosse, L. A., 175
Gounod, Charles, 12, 148, 244, 347
Grateful Dead, 283
guarana, 61
Gutiérrez-Noriega, Carlos, 262–63, 264, 265, 267

Hagar, Stanbury, 87
Haig, Alexander, 201, 211
hallucinations: in cocaine use, 230, 250, 352; in coca use, 41–42, 152, 263, 347
Halsted, W. S., 359
Hammond, William Alexander, 247–52, 253, 257
happiness, sensation of, 40
Harlem, cocaine sales in, 289–317
Harrison Narcotic Act (1914), 11, 280, 348, 358
hashish, 61
"Hashish Club, The," 279

healers, Aymara, 24
heart, coca's effect on, 31, 38, 217–18
Hebrews, ancient, 84, 86
Hellman, Lillian, 281
Helps, Arthur, 144
Heredia, Don Pedro De, 128
Herndon, William Lewis, 144–45
heroin, 11, 319, 358; vs. cocaine, 297–98, 304, 313–14; cocaine combined with, 281, 331, 335, 354; Harlem sales of, 290; narcotic label and, 280, 297, 348; nicknames for, 292; vs. opium, 333; speed-freak conversion to, 359
"Hijack," 283
Hitler, Adolf, 6
"Hold On John," 283
Holmes, Sherlock, as cocaine user, 5, 277, 280, 281
Hopkins, Jerry, 3, 277–88
Hopper, Dennis, 282–83
Huanuco coca, 13, 170–71, 173, 205, 206
Huascar, 87, 100, 105, 106–07, 109, 137
Huayna Ccapac, 83, 87–88, 100, 108, 133, 134, 137
Huitoto Indians, 31
Humboldt, Alexander von, 58–59, 141, 160, 177, 179
Hunter, John, 212
hygrine, 15, 21, 186, 188–89; discovery of, 183–84
hygroline, 21

Ibsen, Henrik, 12, 244
images, coca-produced, 41, 42
impotency, 30
Incas: agriculture and irrigation system of, 79–80; architecture of, 81; astronomy of, 89–90; ceremonies and festivals of, 89–92; coca cultivation of, 79, 81; creation myth of, 94; downfall of, 107–11; Druidical temples of, 98; economic system of, 81–82; government and laws of, 78–79, 88; graves and mummies of, 92–98; handicrafts of, 80–81; hydraulic mining of, 154–55; industry and work ethic of, 80–81; marriage and family institutions of, 82; massacre of, 106, 134; monarch (Inca) of, 77–78, 82–83, 86–87, 88, 106, 110, 346; oral traditions of, 58, 83–85; origin of, legendary, 74–75; physical appearance of, 78; pottery of, 94–95; religion of, 76, 85–89; reverence for dead of, 92–94; roads of, 82, 83; Roman Catholic Church and, 57–58, 76, 105, 106, 125, 136; royal harem and family of, 77–78; ruins of, 124, 125; social and political divisions among, 76–77; Spanish conquest of, 101–17; stone monuments of, 98–99, 153; Sun Temple of, 87–88, 90, 92, 94, 108, 125, 131; sun worship of, 85–86, 87–88, 199; territorial expansion of, 75–76; trephined skulls of, 99–100
Incas, coca use of: as aphrodisiac, 30, 86; in burial, 93, 96, 97, 136, 346; by couriers (*chasquis*), 83, 125, 152, 323; by court orators (*yaravecs*), 23, 58, 84; in divination, 23, 88–89; as "divine plant," 23–24, 50–52, 57, 66, 70, 86, 89, 130, 240, 267, 321, 350–51; in initiation ceremony (*huaraca*), 23, 91–92; as offering, 23, 88–89, 99, 136; paradise assured by, 93, 346; in religious rites, 88–89, 130, 346; in ruling class, 22–24, 130, 267, 272
India, 43, 146
Indians (North American), 61, 84
Indians (South American): authority and, 154; indebtedness forced upon, 115; mine work of, 153–55; as slave laborers, 8, 25, 111–13, 133, 134; Spanish view of, 128, 136; superstitious fears of, 126–27
Indians (South American), coca use of, 12, 21, 22–34, 139–40; Cieza's description of, 129–30, 136; contemporary description of, 323–29; daily amount of, 153, 229, 270; and duration of chew (*cocada*), 25, 152, 270, 323; effect on health of, 27–28, 32–33, 127, 264–68, 334; in farming work, 26; leaf selection in, 14, 33, 65–66, 150, 174, 175; legal prohibitions against, 34, 268, 322, 330; mastication process in, 27, 58–59, 139, 150–52, 248, 266, 269–70, 321–22, 325–26; for medical purposes, 20, 22, 28–31, 34, 269, 330, 334; in offerings, 24, 153, 271, 272; poverty and, 271–72; for religious and ritual purposes, 22–23, 24–25, 34, 57, 270, 272, 327; socioeconomic functions of, 269; time and distance measured by, 25, 127, 152, 323; in travel, 25–26, 42, 67–68, 125, 126, 142, 143–44, 152, 323, 347; withdrawal symptoms absent after, 18, 32,

Indians (South American) (*cont.*) 266–67, 347; workers sustained by, 8, 9, 25, 57, 59, 65, 67–68, 69–70, 112, 134, 140, 143–44, 146, 153, 158, 269, 272, 347
indigestion, coca as treatment for, 44, 156–57
insomnia, coca as cause of, 25
International Opium Conference (1925), 5

Jamaica, coca cultivation in, 43
James, Frank L., 207–08
Java: cinchona cultivation in, 205; coca cultivation in, 171–72, 188, 204, 321
Jefferson Airplane, 283
Johnson, Samuel, 72
Jones, Ernest, 349, 350, 352
Jussieu, Antoine de, 139, 158, 159, 171, 179
Jussieu, Joseph de, 138–39, 159

Kahn, E. J., Jr., 8, 12
Kahn, Zadoc, 244
Kantner, Paul, 283
"key," definition of, 293
"khoka," 57
Kipling, Rudyard, 240
Kógi Indians, 24–25, 30, 327
kola, kola nut, 10, 11, 61, 348
Koller, Carl, 21, 46, 149, 218–20, 221, 329

La Condamine, Charles Marie de, 138, 139, 158
lactose, cocaine cut with, 296, 340
Lamarck, Jean Baptiste Pierre, 159, 170, 179
laryngeal problems, 30, 31, 218, 232, 234–35
larynx, 232–33
Lehmann, Henri, 26, 34
lejía (alkali used with coca), 321–22
Lennon, John, 283
Leo XIII, Pope, 148–49, 244, 347
lichens, 168, 205
Liebermann, C., 187, 188–89
life origins, 200
Lima, Peru, founding of, 109
Lindesmith, Alfred R., 297
Linnaeus, Carolus, 33, 116, 138, 159, 216
llamas, 152, 153, 176
llipta (alkali used with coca), 58–59, 150–51, 169, 170, 179, 207, 208
Lloyd, J. T., 25–26, 323
longevity of coca users, 30–31, 65, 70, 127, 143, 323
Lossen, William, 183, 188
Loubet, Emile, 244
lozenges, cocaine, 5
LSD, 277, 344, 358
Lumière brothers, 244
Luque, Father Hernando de, 101, 102, 103, 104, 105, 109–10
Lyautey, Louis H. G., 12, 244

Mackenzie, Morell, 218, 235, 244
McKinley, William, 12, 245
Maclagan test, 195
Madre de Dios, 145
magicians, Aymara, 24
Magnan's symptom, 230
Maisch, John M., 182–83, 184, 185
maize, 67, 200–01
malaria, 30
Mallinkrodt Chemical Works, 278
malnutrition, 215; coca use and, 28, 33
Malpighiads, 159
Mama Coca, 89, 130, 158, 160, 320, 334, 336
Manco Ccapac, 109, 110, 350–51
Mantegazza, Paolo, 38–42, 64, 146, 218
Mariani, Angelo, 10, 12, 13, 147–49, 151, 187, 217, 218, 243–46, 347, 348
Mariani Thé, 217
marijuana, 15, 278, 289, 297, 300, 319, 345, 358, 359; cocaine used with, 303, 331; Mexican sources of, and cocaine backlash, 3; prices of, 282; regional names for, 279; status in use of, 279, 282
Markham, Clements R., 30, 146–47, 267
Martin, Richard T., 20–34, 329–30, 333–34
Martindale, William, 16, 48–49
Martius, C. F. P. de, 142, 143, 159, 160, 205
Massenet, Jules, 12, 148, 245, 347
masturbation, cocaine treatment for, 249–50
maté, 40, 61
Mattison, J. B., 250–51, 254
Mayer's reagent, 193–94, 195
Mayfield, Curtis, 283–84
medicine: modern, cocaine in, 21; vs. poison, 216. *See also* coca, coca leaves; cocaine

medicine men, 22
Merck Chemical Company, 9, 278, 287, 349
Mésières, Alfred, 245
metabolism, 200–07, 210, 237, 273
methamphetamine, 278
methanol, cocaine purity tested with, 340–41
methedrine, 278
mining, 133, 153–55
Minite, as cutting agent, 278
Mirbeau, Octave, 245
mitta (Indian forced labor system), 111–13, 114–15, 133–34
Mochican pottery, 22–23
Modern Times, 6
Molina, Cristoval, 130
Monardes, Nicolas, 131, 151–52, 158, 167, 178
Monge, Carlos, 29
Montaña region, 321
Moreno, Rita, 283
morphine, 6, 11, 53, 224, 240, 251, 297, 333, 348, 349, 354, 358, 359
morphinism, cocaine as treatment for, 219, 226, 280, 349, 351, 352
Mortimer, William Golden, 10, 13–15, 16, 18, 31, 50–242, 245, 299n
"mossing," 205
mountain sickness, coca as remedy for, 29, 155–56, 334
mucous membranes, 233, 234, 236, 299, 338, 353

Narcotics Commission, U.S., 6
nasal problems. *See* cocaine
Natanson, Leon, 259–61
nausea, coca as treatment for, 227
Nazis, drug use by, 6
Neil, Fred, 282
nervous conditions, coca as treatment for, 226
nervous system. *See* central nervous system
neurasthenia, 214–15, 253, 351
neurotic symptoms, 215, 349
nicotine, 21, 174, 344, 345, 346
nicotinism, 32
Niemann, Albert, 21, 45, 64, 149, 181, 183, 184, 185, 191, 218, 329
Nieschulz, Otto, 8–9, 15, 269–76
Night of the Following Day, The, 283
nitrogen, 199, 200, 201
Novy, Frederick G., 208
Nixon, Richard M., 3
Nowlis, Helen H., 300
nurseries (*almacigas*), coca plants in, 163–64

ointments, cocaine, 5
Ojeda, Alonzo de, 101
Ondegardo, Polo de, 108, 111
ophthalmic surgery, 9, 49, 65, 149, 218–20, 221
opiates: addictive nature of, 4, 21, 32, 250, 251, 330, 353; vs. cocaine and marijuana, 297
opium, 11, 21, 53, 61, 69, 143, 156, 211, 223, 226, 240, 257–58, 277, 297, 348; vs. heroin and morphine, 333
Orbigny, Alcide d', 160
organic process, 198–200
oxygen, 198, 199, 200, 203, 267

Panama, 101, 102, 103, 104, 105, 106, 109, 110, 128, 271
Pantoja, Rodrigo, 112
Parke, Davis and Co., 9, 14, 33, 149
patent medicines, 11, 348, 353
Pemberton, John Styth, 10–11, 348
Peru, 22, 29, 52, 61, 76, 161, 269; climate and topography of, 119–25; coca indigenous to, 169; cocaine production in, 196; coca leaf commerce and production in, 5–6, 125, 144–45; coca mastication process in, 27, 207, 208; coca plant cultivation in, 20, 122, 321; coca regions of, 161; insects of, 125–26; physical aspect of, 118–27; ruins and relics in, 98–99, 123–25; slave system ended in, 115; Spanish conquest and oppression of, 71, 101–17, 125; Spanish discovery of, 101–04
Peru: History of Coca, 10
Peruvian coca (Truxillo), 13, 147, 170–71, 173, 187, 204, 205, 206
phantasmagoria, 41–42
pharmaceutical preparations, coca used in, 44–45
Pharmacological Basis of Therapeutics, The, 297–98
Philip II, King of Spain, 94, 114
"piece," definition of, 293
Piedrahita, 138
Pius X, Pope, 245

Pizarro, Francisco, 57, 74, 101–10, 116, 134
Pizarro, Gonzalo, 110
Pizarro, Hernando, 108, 109, 110, 131
Pizarro, Juan, 110
Plukenet, Leonardi, 158
Poeppig, Eduard von, 22, 24, 142–43, 144, 160, 174, 179, 240, 271
Poincaré, Henri, 12, 245
police, dealers and, 291, 309–11
Ponce de Leon, Juan, 56
Porter, Cole, 6, 280–81
posters, cocaine, 285
potatoes, 60; Indian use of, 157
Potosi, mining operations at, 133–34
poultices, coca in, 44, 269
Prescott, William H., 144
procaine, 278; cocaine cut with, 296, 320, 340, 341
Prohibition, 5
proteid formation, 200–01
Protium heptaphyllum, 27
Pueblo Indians, 87
pulse rate, coca's effect on, 38, 208–09, 211
Pure Food and Drug Act (1906), 5, 11, 280, 348

Quechua Indians, 24, 26
Quijada, Sergio, 30
quinine, 202, 206, 233–34, 296, 340, 341
quinoa plant, 27, 67, 83, 151, 321
quinoline, 188
quipu (Inca knot record), 58, 84–85

Reichel-Dolmatoff, Gerado, 24–25, 30
respiration, coca's effect on, 29, 218, 229, 233
respiratory tract, 232–33
"reverse tolerance," 297
rheumatism, 29, 31, 44, 146, 207
Rinconado, Lake, 123
Ring, Frank, 253–58
Rodin, Auguste, 12, 246
Roman Catholic Church: Incas and, 57–58, 76, 105, 106, 125, 131, 136; Indian traditions suppressed by, 113–14; opposition to coca of, 7–8, 57–58, 59, 70–71, 111, 112
Rostand, Edmond, 12, 246
Ruiz, Bartholomew, 102, 104
Ruiz, Hipólito, 36
Rusby, Henry H., 14, 15, 16, 33, 66–68, 149–50, 173, 189, 236

salt, cocaine cut with, 340
Scherzer, Karl, 181
Schultes, Richard Evans, 18, 27, 318, 349n
Schweig, Henry, 31–32
scopolamine, 21
Searle, W. S., 51
serpent dances, 87
shamans, 22
Shumlin, Herman, 281
Shuttleworth, E. B., 175
Sierra Nevada de Santa Marta, 20, 24, 138
silver mining, 133–34, 154
singers, 234–35
skin diseases, coca advocated for, 226–27
slave labor, 8, 25, 111–13, 133, 134
Slick, Grace, 283
smell, sense of, 221
smuggling, 3, 6, 286, 354–57, 358
"Snowblind Friend," 283
Solomon, David, 3–19
sores, coca applied to, 29, 30
sore throat, coca gargle for, 30
Spaniards: coca as regarded by, 7, 58, 68, 111, 112, 128, 129–32, 134, 136, 140–41, 268, 271, 346–47; excise on coca by, 115–16; gold as object of, 101, 107–08, 109, 110, 114–15; Incas and, 7, 23, 50, 51, 71, 81–82, 85, 101–17, 125, 271, 346–47; Indian enslavement by, 25, 58, 68, 110–15, 133, 347; prejudice against Indian customs of, 128–41 *passim*
Spanish Inquisition, 114
Spector, Phil, 282–83
"speed." *See* amphetamines
"speedball," 281, 331, 354
"speed-freak" phenomenon, 358–59. *See also* amphetamines
Spivey, Victoria, 280
"spoon," definition of, 278
Squibb, E. R., 174, 192, 196
starch, 201, 202
"stash," 294, 295
Steppenwolf, 283
Stevenson, W. B., 179
Steward, Julian H., 9, 16
stimulants, 10, 53, 349; misconceptions about, 216; opposition to, 60–61
Stockman, Ralph, 186

stomach, action of coca on, 236–37
stomatitis, 31
stress, conditions of, 212
Stromberg, Gary, 277–78
sugar, cocaine cut with, 340; raw vs. white, 333
sun, vital role of, 199, 200
Sunfighter, 283
sun worship, Incan, 85–86, 87–88, 199
surgery, cocaine use in, 46, 220, 351
Superfly, 283–85

Taj Mahal, 283
"takeoff cop," 292, 311
tannin, 248, 322
Taylor, Norman, 18
tea, 43, 54, 60–61, 174, 180, 206, 237, 240, 250, 254, 345; with coca, 40; cultivation of, 172
temperatures, body, coca's influence on, 38
theine, 174, 180, 225
theobromine, 43, 201, 225
Thomas, Ambrose, 148
throat infections, 30, 31
Tiahuanaco ruins, 123–24
Titicaca, Lake, 123
tobacco, 18, 61, 174, 208, 236, 267, 353; with coca, 152
Toledo, Francisco de, 111, 113, 132, 133
tolerance, 297, 298, 332
Toronto La Crosse Club, coca experiment of, 210–11
Towns, Charles B., 353
trance states, 22
tropane series, 21
tropeines, 21
"Truckin'," 283
Truxillo coca, 13, 170–71, 173, 187, 204, 205, 206
Tschudi, Johann Jacob von, 14, 26, 28, 30, 142, 143, 151, 179, 219, 267, 270, 271
"two-and-two," 290, 292, 300, 312

Ubell, Earl, 298
Ulloa, Don Antonio d', 139–40, 142
Unanue, Hipólito, 30, 140, 179, 267
United States v. Forty Barrels and Twenty Kegs of Coca-Cola, 348
urea, 201, 202
uric acid, 31, 201, 202, 211, 240, 334
urine, after coca or cocaine use, 208, 209, 248

vaccination, opposition to, 60
Valdez y Palacios, José Manoel, 144
Valera, Padre Blas, 29, 135–36, 139, 179
Valverde, Friar Vicente de, 106, 107, 110
Van Ronk, Dave, 282
Vela, Blasco Nuñez, 134
"Velo-Coca," 210
Verne, Jules, 13, 246
Vespucci, Amerigo, 270
veta (vein), 156
Victorian era, 12, 342
Vin Mariani, 207, 233, 243–46, 347
vitamins, 278; in coca, 28, 334
vocal cords, 232
voice production, adaptation of coca to, 232–35
Volsky, George, 354–55, 356

Wagner, Richard, 56, 234–35
wampum, 84
Weddell, H. A., 28, 142, 143, 144, 180, 236
Weil, Andrew, 299n, 318–36
Wells, H. G., 12, 246
Who, 286
Wiley, Harvey, 348
Willie Dynamite, 285
"Witchy Woman," 283
withdrawal symptoms: absent in Indian coca chewers, 18, 32, 266–67, 347; in cocaine use, 266, 299, 302, 330, 352, 353–54
Woehler, F., 64, 178, 180, 181, 184, 198
Woodley, Richard, 289–317

yerba buena, 28–29
"youth drug scene," 358–59
yuca, 324, 326, 328
Yungas, Bolivia, 150, 171, 271

Zarate, Agustin de, 134
Zinberg, Norman, 318
Zola, Emile, 13
Zoroaster, 86
zoroche. *See* mountain sickness

AUG 3 0 1982

Middlesex County College Library
3 9320 00040440 7

RC
568
C6
C6

The Coca leaf and cocaine papers

Date Due

APR 19 '87	MAY 8 '88	APR 19 '88	
MAY 10 '83	9/6/88	MAY 3 '88	
OCT 26 '83		NOV 17 '88	
DEC 7 '83	OCT 31 '86	OCT 17 '89	
DEC 16 '83	DEC 10 '86	NOV 2 '89	RENEWED
FEB 7 '84	APR 13 '87	DEC 3 '91	
APR 21 '84	NOV 15 '87	MAY 10 1993	
OCT 29 '84		DEC 7 1993	
APR 27 '85	MAR 21 '88		
DEC 13 '85		NOV 27 1996	
MAR 8 '86	AP 4'88		

FEB 11 1998

APR - 9 1998

APR 4 2006

MIDDLESEX COUNTY COLLEGE LIBRARY
EDISON, N.J. 08817

PRINTED IN U.S.A.

(Continued from front flap)

coca concoctions). Californian Jerry Hopkins describes the current cocaine scene in fantasyland, writer Richard Woodley follows a coke dealer on his daily rounds through the streets of Harlem, and Dr. Andrew Weil analyzes the quality of life in a small coca-growing community in the high Andes. As the centerpiece of the collection, William Golden Mortimer's *The Divine Plant of the Incas* is presented in all its essential elements. This massive manuscript is the most valuable single contribution to be found in the entire world literature, tracing with both scholarship and scientific insight the medical and social uses of coca and cocaine from archaic to modern times.

Included also are the scientific findings of eminent physicians who have personally experienced as well as investigated the coca and cocaine experiences; these include instances of the so-called cocaine habit and the devastating aftereffects of cocaine abuse.

The Coca Leaf and Cocaine Papers should help dispel the mists of official ignorance which have shrouded coca and cocaine for the better part of a century.

About the Authors

David Solomon was born in California in 1925. Among his previous books are *The Consciousness Expanding Drug, The Marijuana Papers,* and, with George Andrews, *Drugs and Sexuality.* David Solomon lives in England with his wife and two daughters.

George Andrews was born in 1926 in the United States. He has published *The Book of Grass,* a volume of poetry called *Burning Joy,* and *Drugs and Magic,* his most important work to date. George Andrews lives in London with his wife. He has five children and three grandchildren.

Jacket design by Herb Lubalin

Jacket photographs by Culver Pictures, Inc. and Wide World Photos

Harcourt Brace Jovanovich, Inc.
757 Third Avenue, New York, N.Y. 10017

THE COCA LEAF & COCAINE PAPERS

CONTENTS

1. Coca and Cocaine: Uses and Abuses, by the Editors	3
2. The Role of Coca in the History, Religion, and Medicine of South American Indians, by Richard T. Martin	20
3. Coca Experiences, by Paola Mantegazza	38
4. Coca, Cocaine and Its Salts, by William Martindale	43
5. The Divine Plant of the Incas, by William Golden Mortimer	50
6. The Mariani Album: 1884–1913	243
7. Cocaine and the So-called Cocaine Habit, by W. A. Hammond	247
8. Cocaine and Its Fascinations, from a Personal Experience, by Frank W. Ring	253
9. Concerning Nasal Lesions Among Cocaine Sniffers, by Leon Natanson	259
10. Mental Alterations Produced by Coca, by Carlos Gutiérrez-Noriega	262
11. The Anti-fatigue Action of Cocaine and Habituation to Coca in Peru, by Fernando Cabieses Molina	264
12. Cocaism and Cocainism, by Otto Nieschulz	269
13. Cocaine Consciousness: The Gourmet Trip, by Jerry Hopkins	277
14. Dealer: Portrait of a Cocaine Merchant, by Richard Woodley	289
15. The Green and the White, by Andrew Weil	318
16. The Gourmet Coke Book, Anonymous	337
17. The Consumers Union Report on Coca Leaf and Cocaine, by Edward M. Brecher and the Editors of *Consumer Reports*	344

0-15-118237-X